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# 4 - I/O architectures, hot standby solution and Momentum I/O

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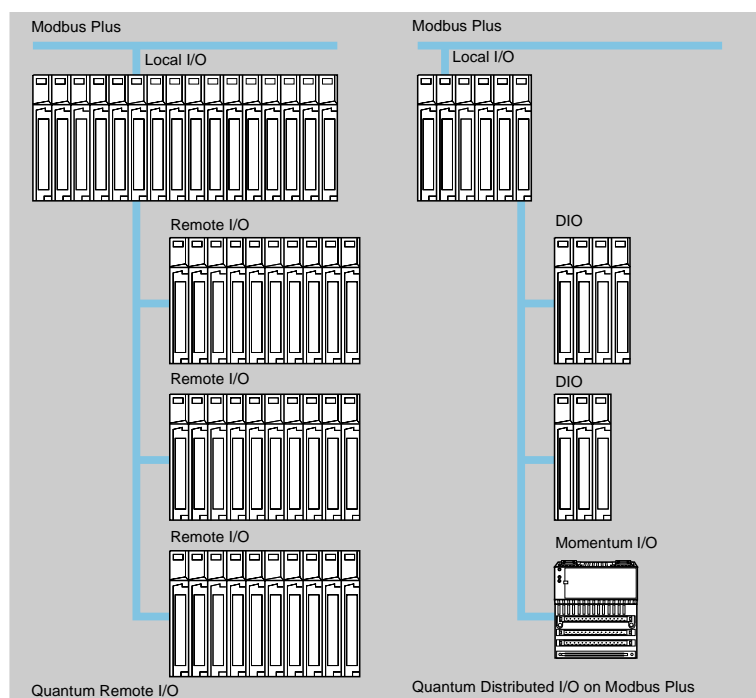
### Overview

The Modicon Quantum Automation Series provides a highly flexible architecture that ensures a cost-effective and high performance control solution, regardless of the configuration. From centralized systems to highly distributed systems to networked distributed control schemes, Quantum provides the right solution.

Quantum I/O can be used in three major architectures to meet control system requirements:

- Local I/O.
- Remote I/O (RIO).
- Distributed I/O (DIO).

Whether your requirements are for improved space utilization, reduced installation costs, high performance, or connectivity to HMI and host computers, Quantum I/O has an architecture that fits. Combining these different I/O architectures with Quantum's wide range of communication options, an optimal control system can be configured and installed to meet the most challenging control requirements.



I/O architecture selection	Local I/O	Remote I/O	Distributed I/O
<b>Media</b>	—	Coax	Twisted pair
<b>Maximum distance without repeaters</b>	—	15,000 ft (4,572 m)	1,500 ft (457 m)
<b>Speed</b>	—	1.5 MHz	1 MHz
<b>Scan synched I/O servicing</b>	—	Yes	No
<b>Hot standby support</b>	No	Yes	No
<b>Momentum I/O support</b>	—	No	Yes
<b>Modbus Plus compatible</b>	—	No	Yes
<b>Maximum</b>			
Drops per network	—	31	63
I/O words per network	—	1,984 in/1,984 out	500 in/500 out
I/O words per drop	64 in/64 out	64 in/64 out	30 in/32 out
Discretes per network	—	31,744 in/31,744 out	7,840 in/7,840 out
Discretes per drop	1024 in/1024 out	1024 in/1024 out	480 in/512 out
Analogues per network	—	1,984 in/1,984 out	500 in/500 out
Analogues per drop	64 in/64 out	64 in/64 out	30 in/32 out
<b>Networks per controller</b>	—	1	3
<b>Typical backplanes</b>	6, 10, 16 slots	10, 16 slots	2, 3, 4 slots

### Local I/O

The Quantum automation platform provides local I/O support for control systems where the wiring is most effectively brought from the field to the main control cabinet. Local I/O can comprise as few as one I/O module or as many as 14 modules along with a programmable logic controller (a Quantum CPU) and a power supply module in a single backplane. Local I/O can support up to 1344 I/O points in a 1845 cm<sup>2</sup> (286 in<sup>2</sup>) panel space. Local I/O can also be expanded to a second backplane with the use of a Backplane Expander.

If required for the application, system option modules can also be installed in the local backplane. Available system option modules include RIO processors (one/CPU supported) or Modbus Plus network interfaces (two/CPU supported). All other available modules are considered and configured as I/O modules.

Selection of the appropriate backplane depends on the required number of modules for the system. Backplanes are available in 2-, 3-, 4-, 6-, 10-, and 16-slot versions.

If required, communications and networking modules can also be installed in the local backplane. Most communication and networking modules require the local CPU to be present; the exception is the 141 MMS 425 01 multi-axis SERCOS motion module, which can operate as a standalone. Available Quantum communications and network modules include:

- Modbus Plus and Modbus modules.
- Ethernet modules for TCP/IP, SY/MAX and MMS.
- Remote I/O modules.
- Hot Standby modules.
- SERCOS multi-axis servo motion control modules.
- InterBus modules.
- Lonworks modules.
- ProfiBus modules.
- As-iBus modules.

### High performance interrupt functions

In certain applications, I/O needs to be updated faster than the normally scheduled scan time. Quantum provides interrupt I/O services for high-speed applications. These services include time interrupt processing, interrupt input, and immediate I/O updates that support high-speed throughput of critical I/O located in the local backplane. The services are driven by instructions embedded in Quantum's logic language. The instructions can be programmed via ProWORX or Concept programming software; they update the I/O immediately within the CPU. Utilizing a subroutine section in the CPU, the updated I/O table can be used to update logic only, or write to any local output module. Interrupt services increase machine productivity, yielding higher throughput and better utilization of capital equipment.

### Local I/O configuration rules

When you configure a local I/O system, consider the following four characteristics:

- Available backplane slots for modules.
- Available power for the installed modules.
- Available addressing words to configure the modules.
- Available option module slots.

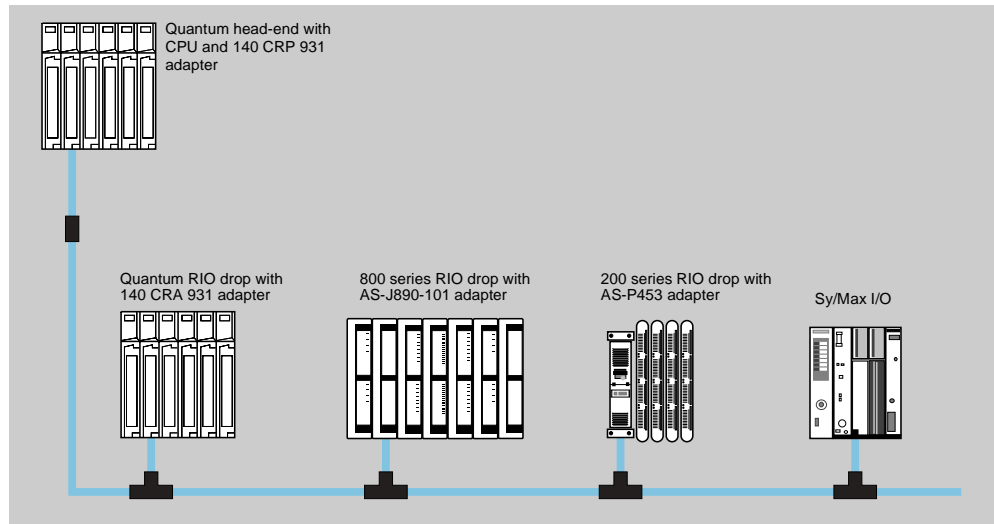
A local I/O system can support up to 14 slots for option processors and I/O modules in a 16-slot backplane. If fewer I/O modules are required, smaller backplanes can be used. For applications requiring more than 14 slots, a backplane expander can be used, and RIO and/or DIO can be added to the system. Empty modules (140 XCP 500 00) are available to occupy unused slots.

Every CPU, option module and I/O module requires power from the backplane. This power is provided by the system power supply. To ensure a valid configuration, simply add up the required backplane current (in mA) for all modules in the local backplane, and ensure that the total current is less than that provided by the selected power supply.

A Quantum CPU in a local I/O drop can handle up to 64 input words and 64 output words of I/O addressing. A 16-bit input or output module is equal to one word. Simply add up the addressing requirements for each module to ensure that the limit is not exceeded.

### Presentation

For applications that require large I/O drops remotely mounted, highest I/O performance, and/or connectivity to existing Modicon remote I/O installations, the Quantum Automation Series provides a remote I/O (RIO) architecture solution. Based on the S908 remote I/O network technology, this network is compatible with existing installations of Modicon I/O products, including the 800 and 200 Series I/O modules and Sy/Max I/O. New installations can incorporate an installed base of these devices for reduced installation costs.



RIO is based on a coaxial cabling scheme that provides long-distance capability, up to 5 km (16 400 ft) with CATV cable or longer with optional fiber optic cable. It is a high-performance network operating at 1.544 Mbits/s for high I/O data throughput. The RIO cable system consists of a linear trunk line, with line taps and drop cables running to each remote drop. Up to 31 remote drops are configurable. Each drop can support up to 128 I/O words (64 words in/64 words out).

### Modicon segment scheduler

The Modicon segment scheduler complements the high performance of the RIO network by interleaving I/O servicing and logic solving to create the fastest system throughput available.

The segment scheduler breaks application programs into logical segments, then schedules I/O servicing to occur in conjunction with the segment's associated logic solving. Inputs are read prior to logic being solved and outputs are written after logic is solved. This eliminates the need to wait for an entire scan before outputs are set, giving a faster system response than comparable control systems. As a result, there is no performance penalty for using RIO—it is as fast as local I/O.

For most systems, throughput of local or remote I/O can be estimated at no less than two times scan (assumes measurement of input and output times through 24 V d.c. modules). In addition, all analog and register values are updated automatically, as fast as discrete I/O, without user programming.

### Compatibility with the 800 and 200 Series I/O products

For forward integration from existing Modicon systems, the Quantum Automation Series is compatible with the 800 and 200 Series I/O products. Using the same RIO head end interface, it connects to 800 Series I/O via the P890300 RIO adapter, and to 200 Series I/O via the P453/J290 and P451/J291 RIO adapters.

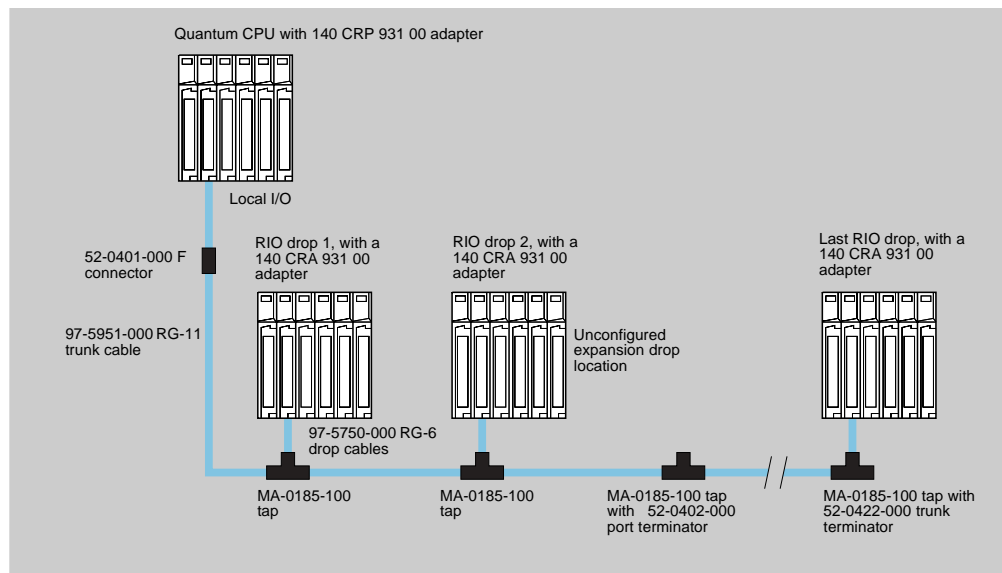
Other standard Modicon components are also compatible with this system, including network taps (MA-0185-100) and splitters (MA-0186-100). Quantum remote I/O also supports drops of Sy/Max I/O.

### Rules of configuration

To ensure a valid configuration, add up the required backplane current (in mA) for all modules at each I/O remote location, and ensure the total is less than the available power in the selected power supply.

#### RIO cable topologies

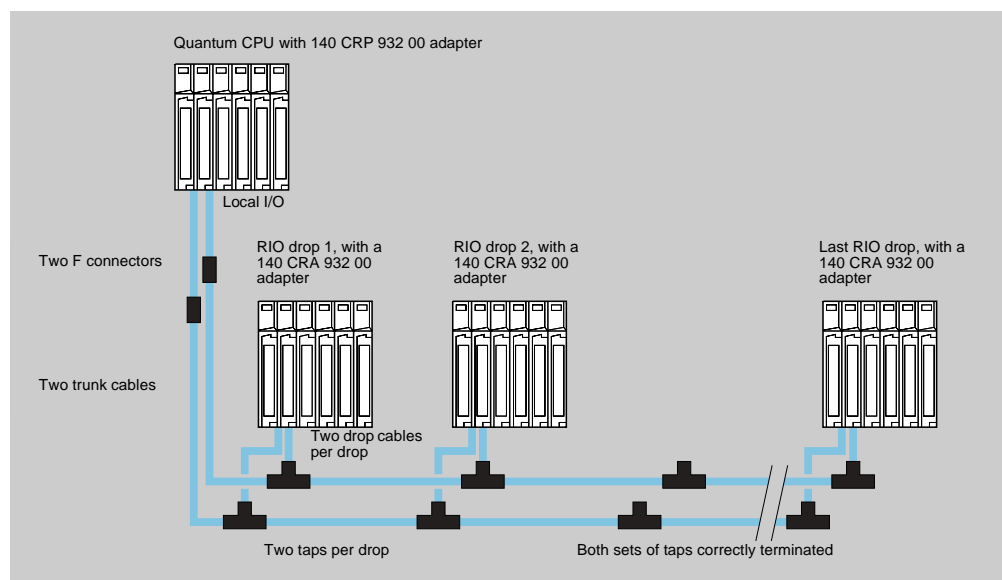
##### A single-cable RIO topology



An MA-0185-100 tap is required for every drop on the system to electrically isolate the drop from the trunk and protect the system from impedance mismatches and cable disconnections. A minimum signal strength of 14dB is required between the trunk and each drop to ensure correct operation. The signal loss on the trunk cable as it crosses the tap is less than 1dB. A total of 35 dB is available from the head-end RIO processor. The entire cabling architecture must not exceed this system limit.

For systems that require high availability, a redundant-cable option is available to protect the system from cable breaks and damaged connectors. With two cables connected between the host and each drop, a single cable break does not disrupt communications. If a cable break occurs, a health bit is set to indicate the problem node and faulty cable. For preventative maintenance, the system also provides retry counters for all communication transactions to all nodes. High retry counts on a cable in a specific node could indicate connection problems that can be scheduled and corrected prior to unwanted downtime.

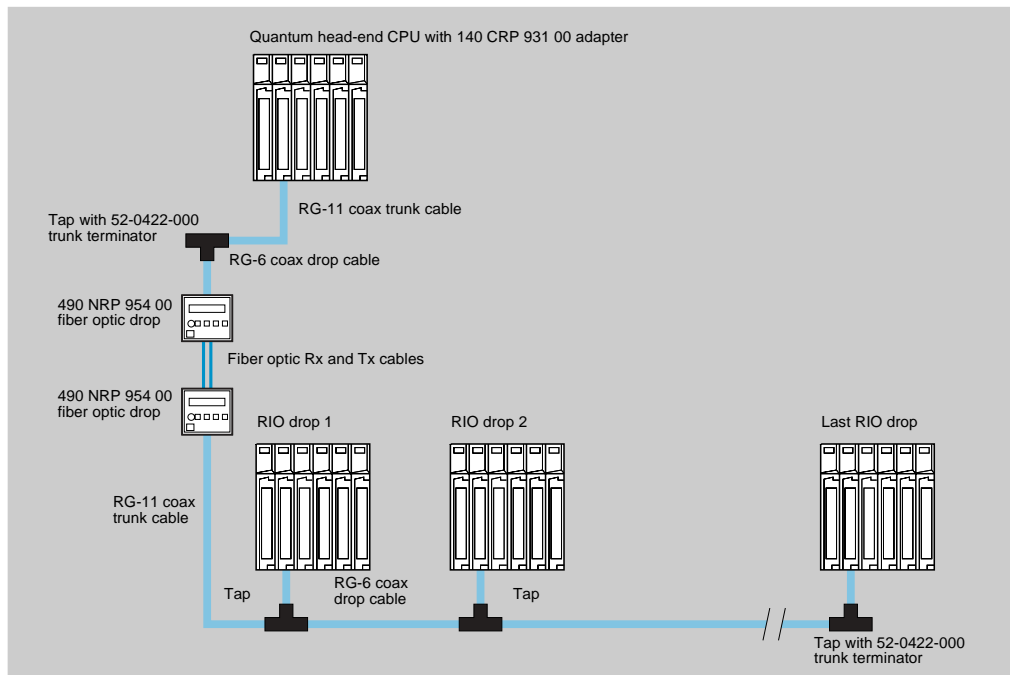
##### A redundant-cable RIO topology





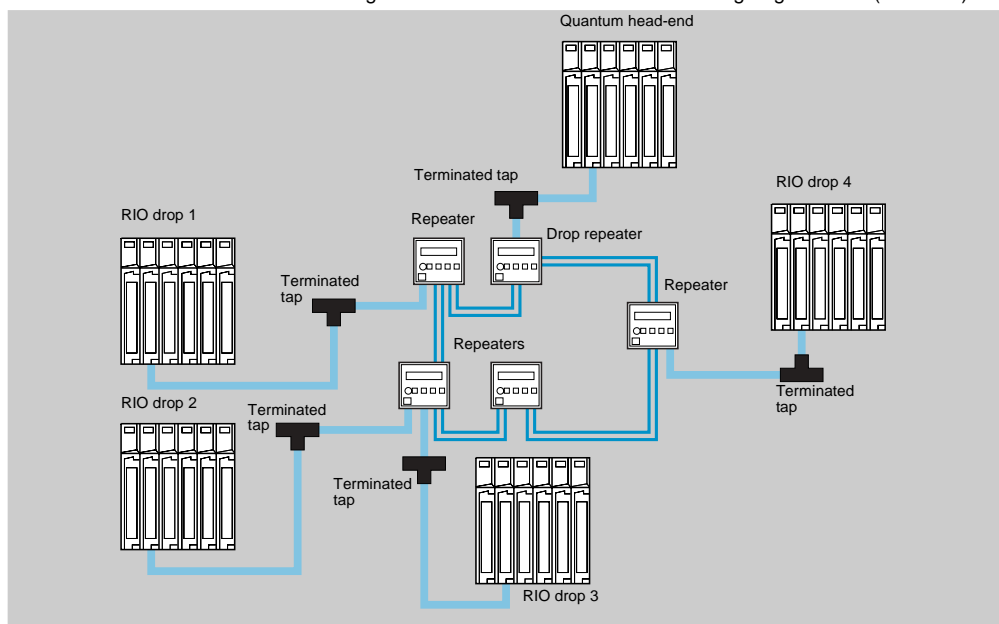
#### Point-to-point RIO communications with fiber optic repeaters

Fiber optic repeaters are available to enhance network noise immunity and increase cable distance to as much as 15 km (9.3 miles). Repeaters convert the twisted-pair cable to standard 62.5/125  $\mu$ m fiber while maintaining the full dynamic range of the network.



#### A self-healing ring topology

Multiple 490 NRP 954 00 fiber optic repeaters can be interconnected in a closed loop ring so that if a break occurs anywhere in the ring the network can reconfigure itself. The RIO signal is sent down both legs of the ring by the drop repeater to the head repeaters. When a signal is received on one Rx line, the other Rx channel is blanked—this prevents the same signal from being transmitted twice in the ring. The maximum length of fiber cable allowed in a self-healing ring is 10 km (32 000 ft).



#### Head-end adapter and drop adapter characteristics

Model			140 CRP 931 00	140 CRP 932 00	140 CRA 931 00	140 CRA 932 00
Type			Head-end		Drop adapter	
Drop type			Quantum, 200 series, 500 series, 800 series, or Symax (any mix)		–	
I/O type			–		Quantum	
Modules/drop			31 (drops) max.		27 (modules) max.	
Words/drop			64 in/64 out words			
ASCII			2 ports per drop, 32 ports (16 drops), max. (requires use of AS-P892-000, AS-J892-101/102, or AS-J290-0X0 at the RIO drops).			
Coax termination		Ω	Internal 75			
Coax shield			Tied to chassis ground		Capacitor to ground	
Data transfer rate		mb	1.544			
Dynamic range		dB	35			
Isolation		≡	500 V coaxial cable, center conductor to ground			
Cable connections	Single cable		One "F" type female connector with a right angle adapter			
	Redundant cable		Two "F" type female connectors with a right angle adapter			
General	Holdup time		–		Software configurable NOTE: In the event of a communication loss with the remote processor, output modules during this time will retain their last operating state. Input module data will be held in the system controlling CPU. After this time, output modules will assume their predefined timeout states and inputs will be zeroed by the CPU.	
	Diagnostics		Power Up Dual port memory check LAN controller check		Power Up and Runtime Executive checksum RAM address/data	
	Maximum number of CPRs supported by the controller		1		–	
	Bus current requirement	mA mA	Single channel: 600 Dual channel: 750			
	Power dissipation	W W	Single channe: 3 Dual channel: 3.8			
Agency approvals			UL 508, CSA 22.2-142, cUL, FM Class 1 Div.2, CE			

#### Fiber optic cable considerations

If you are using a fiber optic link in your RIO network, consider the following when selecting fiber optic cable from a vendor:

For most applications, 62.5/125  $\mu\text{m}$  cable is recommended because of its relatively low loss and low signal distortion. However, in high optical power applications, such as those that use splitters or star couplers, the 100/140  $\mu\text{m}$  cable should be used.

Wherever possible, select a multiconductor cable. It is inexpensive; it provides a backup path in case a cable gets cut in the process of pulling it; and you can use the extra path for voice, video, or other communications

# Quantum automation platform

I/O architectures

Remote I/O

4

## Modules

Description	Cable	Reference	Weight kg (lb)
Quantum RIO head-end adapter	Single-cable	140 CRP 931 00	–
	Redundant-cable	140 CRP 932 00	–
Quantum RIO drop adapter	Single-cable	140 CRA 931 00	–
	Redundant-cable	140 CRA 932 00	–
RIO fiber optic drop	–	490 NRP 954 00	–

## Cables

Description	Length	Reference	Weight kg (lb)
RG-6 coaxial quad shield cable (sold by the roll)	320 m (1000 ft)/roll	97 5750 000	–
RG-11 coaxial quad shield cable (sold by the roll)	320 m (1000 ft)/roll	97 5951 000	–
Preambled drop cable (with F connectors, self-terminating F adapter, and quad shield RG-6 cable)	15 m (50 ft)	AS MBII 003	–
	42 m (140 ft)	AS MBII 004	–

## Accessories

Description	Length	Reference	Weight kg (lb)
Backplane expander	–	140 XBE 100 00	–
Expander cables	1 m	140 XCA 717 03	–
	2 m	140 XCA 717 06	–
	3 m	140 XCA 717 09	–

**Accessories** (continued)

Description	Quantity	Reference	Weight kg (lb)
Tap (connects a drop cable to the trunk cable)	1 tap	MA 0185 100	—
Splitter (splits a signal from a single cable for two-cable use)	—	MA 0186 100	—
Tap terminator (for unused drop locations)	1 terminator	52 0402 000	—
Trunk terminator (for last tap on the network)	1 terminator	52 0422 000	—
<b>F connector</b>			
For RG-6 quad-shield cable	10 connectors cassette	MA 0329 001	—
For RG-11 cable	6 connectors bag	490 RIO 002 11	—
Right-angle F adapter for semi-rigid cable	1 adapter	52 0480 000	—
BNC connector for RG-6 quad-shield cable	1 connector	043509446	—
F-to-BNC adapter for RG-11 cable	1 adapter	52 0614 000	—
BNC jack to male F connector (with J890/J892 drop adapters)	1 jack	52 0724 000	—
BNC in-line terminator	1 terminator	60 0513 000	—
<b>Coaxial cable stripping tool</b>			
For RG-6	1 tool	490 RIO 004 00	—
For RG-11	1 tool	490 RIO 0S4 11	—
<b>Replacement blade pack</b>			
RG-6	2 blades	490 RIO 004 06	—
RG-11	—	Consult our regional sales office	—
Ground block	1 block	60 0545 000	—
<b>Crimping tools</b>			
F connector on RG-6	1 tool	60 0544 000	—
F connector on RG-11	1 tool	490 RIO 0C4 11	—
BNC connector on RG-6	1 tool	043509432	—
Cable cutter	1 tool	60 0558 000	—

## Presentation

The Modicon Quantum automation platform delivers a distributed I/O (DIO) architecture that provides cost-effective and flexible solutions for controlling and monitoring I/O signals over a wide area. The Quantum DIO architecture uses the same I/O modules as a local or remote I/O (RIO) subsystem, and reduces installation costs by using low-cost, twisted-pair cables. A special DIO drop adapter with a built-in power supply is used at each drop.

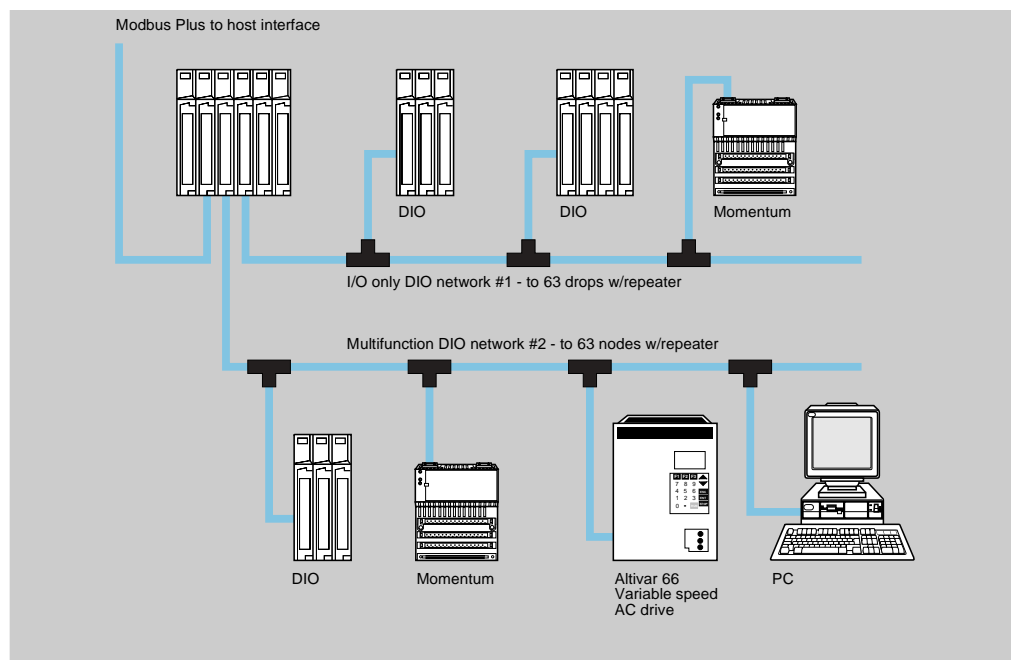
Quantum DIO drop adapters are specifically designed to link Quantum I/O modules to the head via twisted-pair shielded cable. A drop adapter also provides the I/O with power (maximum 3A) from a 24 V d.c. or 115/230 V a.c. source. DIO drops may also be powered by standard Quantum 8 A power supply modules, in which case the 3 A supply built into the drop adapter is not used.

A DIO drop is smaller than an RIO drop, but more drops can be supported and they can be spread over a wider area than an RIO network. RIO supports a linear configuration up to 4500 m (15 000 ft) long, while the DIO architecture supports up to three network heads per CPU and up to 1800 m (6000 ft) per network (using RR85 repeaters). Even greater distances can be achieved using fiber optic repeaters.

The DIO architecture is based on Modbus Plus technology. A DIO network can support 32 nodes over 500 m (1500 ft); by using repeaters, the DIO network length can be extended to 2000 m (6000 ft) and can support up to 64 nodes. Up to three DIO networks are supported – one is native to the CPU itself, and the other two are available by adding optional 140 NOM 211 x0 or 140 NOM 212 x0 network interface modules into the Quantum backplane. With three DIO networks, a single CPU can support 189 drops of I/O. DIO can be combined with RIO in the same CPU system for significantly larger I/O counts.

All products that currently support Modbus Plus can coexist on the DIO network. For example, a programming panel can be connected to the DIO network to monitor and troubleshoot an operating control system from the remote site, without running a separate communication link. In addition, HMI devices like a PanelMate Plus or FactoryMate Plus can participate on the network to reduce the number of networks required for a system. Distributed systems can have HMI devices at remote stations without either a separate communications link or a local controller present, which significantly reduces hardware and installation costs.

## Typical Multi-Network Distributed I/O System



Using Modbus Plus for distributed I/O

Modbus Plus can be used as the fieldbus for a distributed I/O network under the control of a Quantum CPU. A Modbus Plus master needs to reside at the head end of the network (as either a 140 NOM 21● module or Quantum CPU with a built-in Modbus Plus interface). A 140 CRA 211 ●● module must reside in each distributed I/O drop on the network. A CRA module acts as both a distributed I/O adapter and a power supply for the drop; no additional power supply modules are required. Each DIO drop can address up to 30 input words and 32 output words.

A single or redundant cable topology may be employed in the distributed I/O system. Depending on your system's requirements, one of the following module combinations can be used to set up a Modbus Plus-based DIO system:

At the head	At the drop	Type of system
CPU with MBP or 140 NOM 211 00	140 CRA 211 10	Single cable with ~ 115/230 V power source at the drop
CPU with MBP or 140 NOM 211 00	140 CRA 211 20	Single cable with --- 24 V power source at the drop
140 NOM 212 00	140 CRA 211 10	Redundant cable with ~ 115/230 V power source at the drop
140 NOM 212 00	140 CRA 211 20	Redundant cable with --- 24 V power source at the drop

Description

The Modbus Plus 140 NOM●● 00 modules at the end of the network comprise on the front panel:



- 1 Model number and color code
- 2 LED Status indicators comprising:
  - Ready (green)
  - Fault (red)
  - Pwr ok (green)
  - Modbus + (green)
  - Error A (red)
  - Error B (red)
- 3 Removable, hinged door with customer identification label
- 4 Microswitch
- 5 Modbus port
- 6 Modbus Plus

### Drop interface characteristics

Model		140 CRA 211 10	140 CRA 212 10	140 CRA 211 20	140 CRA 212 20
Function		DIO drop interface ~ source voltage	DIO drop interface ~ source voltage	DIO drop interface --- source voltage	DIO drop interface --- source voltage
Cable connections		Single	Redundant	Single	Redundant
Input voltage		~ 85 ... 276 V	~ 85 ... 276 V	--- 20 ... 30 V	
Frequency range		Hz	47 ... 63	47 ... 63	—
Input current		A	0.4 @ ~ 115 V 0.2 @ ~ 230 V	0.4 @ ~ 115 V 0.2 @ ~ 230 V	1.6
Inrush current		A	10 @ ~ 115 V 20 @ ~ 230 V	10 @ ~ 115 V 20 @ ~ 230 V	30
Power input		VA	50	50	—
Buffer time		cycle	0.5 @ full load and minimum line voltage/frequency and less than 1 s between interrupts		Max. 1.0 ms
Fusing		A	1.5 external	1.5 external	2.5 external
Bus output	Voltage	---	5.1 V		
	Current	A	3		
	Minimum load	A	0		
	Protection		Over-current, over-voltage		
Words			30 I / 32 O (two additional input words are reserved for I/O drop status)		
Diagnostics startup	RAM		Yes		
	RAM Address		Yes		
	Checksum		Yes		
	Processor		—		
Run time	RAM		Yes		
	RAM Address		Yes		
	Checksum		Yes		
	Processor		—		
Field wiring			Terminal block, 7-pole		
Power dissipation		W	11		

## DIO drop adapters/power supplies/cables characteristics

Model		140 CRA 211 10	140 CRA 212 10	140 CRA 211 20	140 CRA 212 20
Input requirements	Voltage	~ 85...276 V			== 20...30 V
	Frequency	Hz	47...63		
	Voltage total harmonic distortion		Less than 10% of the fundamental rms value		
	Current	A	0.4 @ ~ 115 V 0.2 @ ~ 230 V		
	Inrush current	A	10 @ ~ 115 V 20 @ ~ 230 V		
	VA rating	VA	50		
	Power interruption	s	1/2 cycle @ full load & minimum rated line voltage/frequency. No less than 1 between interruptions		
	Fusing (external)	A	1.5 (part # 043502515 or equivalent)		
	Operating mode		Standalone or not powered		
Output-to-bus	Voltage	==	5.1 V		
	Current	A	3		
	Minimum load	A	0		
	Protection		Over current, over voltage		
Communication	Modbus Plus		1 port (single cable) 2 ports (dual cable)		
General	Specifications		I/O type: Quantum modules/drop: depends on bus current loading and word count words: 30 in/32 out (two additional input words are reserved for drop status)		
	Diagnostics		Power-up runtime RAM data/address executive checksum		
Field wiring connector			7-point terminal strip (part # 043506326)		7-point terminal strip (part # 043503328)
Internal power dissipation			2.0 V + 3.0 V x I <sub>BUS</sub> = Watts, where I <sub>BUS</sub> is in A)		



## Head-end module characteristics

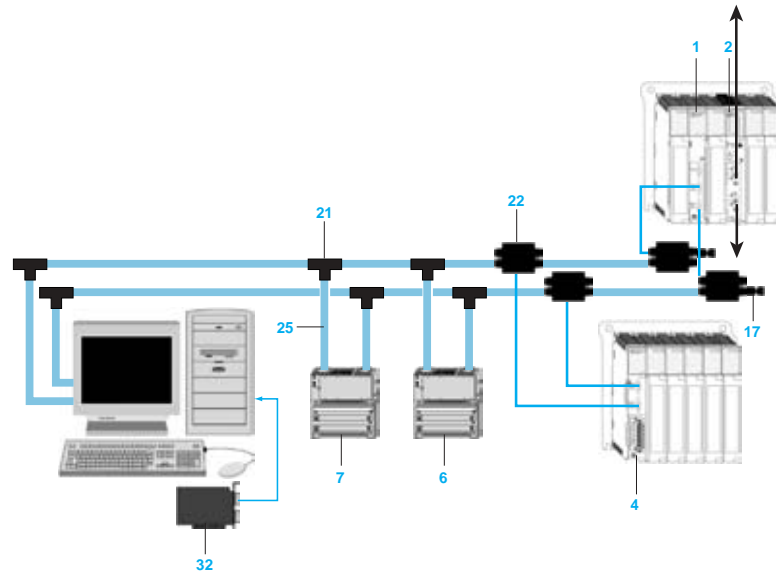
Model		140 NOM 211 00	140 NOM 212 00	140 NOM 252 00
Function		DIO head-end interface for twisted-pair cable	DIO head-end interface for twisted-pair cable	DIO head-end interface for twisted-pair cable
Cable connections		Single	Redundant	2 (transmit and receive pairs)
Communication ports		1 Modbus (RS 232) 1 Modbus Plus (RS 485)	1 Modbus (RS 232) 2 Modbus Plus (RS 485)	1 Modbus (RJ 45) 2 Modbus Plus (fiber optic cable)
Words		30 in / 32 out (two additional input words are reserved for I/O drop status)		
Diagnostics startup	RAM	Yes		
	RAM Address	Yes		
	Checksum	Yes		
	Processor	Yes		
Run time	RAM	Yes		
	RAM Address	Yes		
	Checksum	Yes		
	Processor	Yes		
Bus current required		mA	780	780
Power dissipation		W	4	4
Data rate		MBPS	1	1
Pulse width distortion/jitter		ns	–	5 or better
Wavelength		nm	–	820
Power loss budget (including 3 dB margin)	50/125 mm fiber	dB	–	6.5
	62.5/125 mm fiber	dB	–	11
	100/140 mm fiber	dB	–	16.5
Optical transmission	50/125 mm fiber	dBm	–	-12.8 ... -19.8
	62.5/125 mm fiber	dBm	–	-9 ... -16
	100/140 mm fiber	dBm	–	-3.5 ... 110.5
Rise/fall time		ns	–	20 or better
Optical receiver	Sensitivity	dBm	–	30 or better
	Dynamic range	dB	–	20
	Detected silence	dBm	–	-36

# Quantum automation platform

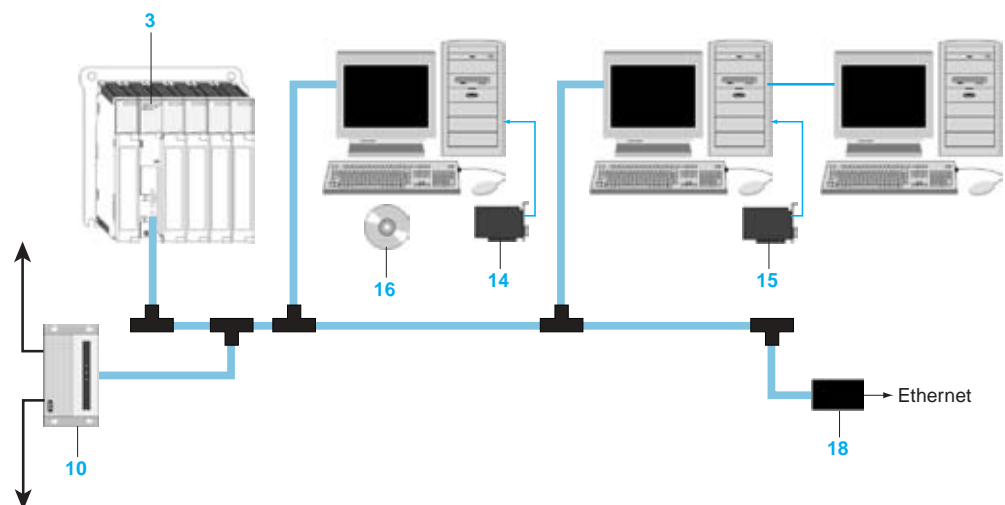
## I/O architectures

### Modbus Plus network, network layout with components

#### Quantum redundant Modbus Plus network



#### Network with PC cards for Modbus Plus



- 1 140 NOM 212 00 Quantum Modbus Plus Head-end Interface, redundant support, twisted pair cable.
- 2 140 NOM 252 00 Quantum Modbus Plus Head-end Interface, single-cable support, fiber optic cable.
- 3 140 NOM 211 00 Quantum Modbus Plus Head-end Interface, single-cable support, twisted pair cable.
- 4 140 CRA 212 10 Quantum Modbus Plus Drop Interface and power supply, redundant support, 115/230 VAC.
- 5 140 CRA 211 10 Quantum Modbus Plus Drop Interface and power supply, single-cable support, 115/230 VAC.
- 6 170 PNT 160 20 Momentum Modbus Plus Communication Adapter, redundant network, IEC support.
- 7 170 NEF 160 21 Momentum Modbus Plus Communication Adapter, redundant network, 984 support.
- 8 170 NEF 110 21 Momentum Modbus Plus Communication Adapter, non-redundant network, 984 support.
- 9 170 PNT 110 20 Momentum Modbus Plus Communication Adapter, non-redundant network, IEC support.
- 10 490 NRP 254 00 Modbus Plus Repeater, line/drop, fiber optic support.
- 11 490 NRP 253 00 Modbus Plus Repeater, point-to-point, fiber optic support.
- 12 NW-BM85C-002 Modbus Plus Bridge/Multiplexer, panel or shelf mount, 4 Modbus Plus ports.
- 13 NW-RR85-001 Modbus Plus Repeater, coaxial cable.
- 14 AM-SA85-030 Modbus Plus ISA PC Adapter Card, single port.
- 15 416 NHM 300 30 Modbus Plus PCI PC Adapter Card, single port.
- 16 SW-MXDS-001 Modbus Plus Driver Suite.

## Modbus Plus network, network layout with components

**Modbus Plus products, cables and accessories****Modbus Plus bridges and repeaters**

Description	Support	No and type of ports	References	Weight kg (lb)
<b>Modbus Plus Bridge multiplexer</b>	Panel or shelf	2 Modbus Plus / 4 RS 232 Modbus	<b>NW-BM85C002</b>	–
	Panel or shelf	1 Modbus Plus / 4 RS 232 Modbus	<b>NW-BM85-000</b>	–
	Rack-mount	2 Modbus Plus / 4 RS 232 Modbus	<b>NW-BM85D008</b>	–
<b>Modbus Plus programmable bridge/multiplexers</b>	Rack-mount	2 Modbus Plus / 4 RS 232 programmable	<b>NW-BM85D002</b>	–
	Panel or shelf	2 Modbus Plus / 4 RS 232 programmable	<b>NW-BM85S232</b>	–
	Panel or shelf	2 Modbus Plus / 4 RS 485 programmable	<b>NW-BM85S485</b>	–
<b>Modbus Plus bridge Plus</b>	–	4 Modbus Plus	<b>NW-BP85-002</b>	–
<b>Modbus Plus repeater</b>	Coaxial cable	–	<b>NW-RR85-001</b>	–
<b>Point-to-point</b>	Fiber optic	–	<b>490 NRP 253 00</b>	–
<b>Line/drop</b>	Fiber optic	–	<b>490 NRP 254 00</b>	–

**Modbus Plus communication devices**

Description		Support	No and type of ports	References	Weight kg (lb)	
Quantum Modbus Plus	Drop interface and power supply	Single-cable	~ 115/230	140 CRA 211 10	—	
			--- 28	140 CRA 211 20	—	
		Redundant	~ 115/230	140 CRA 212 10	—	
			--- 28	140 CRA 212 20	—	
	Head-end interface	Single-cable	Twisted pair cable	140 NOM 211 00	—	
		Redundant	Twisted pair cable	140 NOM 212 00	—	
		Single-cable	Fiber optic cable	140 NOM 252 00	—	
	Momentum Modbus Plus	Communication adapter	Non-redundant	IEC support	170 PNT 110 20	—
			Network	984 support	170 NEF 110 21	—
Redundant			IEC support	170 PNT 160 20	—	
Network			984 support	170 NEF 160 21	—	

**Modbus Plus products, cables and accessories (continued)****Connectors**

Description	Quantity	References	Weight kg (lb)
Modbus Plus inline	1 per kit	AS-MBKT-085	–
Modbus Plus terminating	2 per kit	AS-MBKT-185	–
Modbus Plus network cable installation tool	–	AS-MBPL-001	–
Modbus Plus “T” connector (DB9 base)	1	170 XTS 020 00	–
RJ 45 terminator	2 per kit	170 XTS 021 00	–
RS 485 (DB9 base) cable connector “T” for RJ 45	–	170 XTS 040 00	–
RJ 45 shielded connectors	20 per kit	170 XTS 022 00	–
RS 485 (RJ485) cable connector “T” for RJ 45	1	170 XTS 041 00	–
RS 485 multi-master RJ 45 shunt plugs	2	170 XTS 042 00	–

**Taps**

Description	Quantity	References	Weight kg (lb)
Modbus Plus tap, IP 20	1	990 NAD 230 00	–
Modbus Plus ruggedized tap, IP 65	1	990 NAD 230 10	–
Modbus Plus ruggedized tap terminators	2 per kit	990 NAD 230 11	–
Modbus Plus ruggedized tap DIN rail mounting bracket assembly	1	990 NAD 230 12	–
Modbus Plus lightning arrestor	1	490 NAC 721 00	–

**Host Adapters - PC Interface Kits**

Description	Quantity	References	Weight kg (lb)
Modbus Plus ISA PC Adapter Card	1	AM-SA85-030	–
	2	AM-SA85-032	–
Modbus Plus PCI PC Adapter Card	1	416 NHM 300 30	–
	2	416 NHM 300 32	–
Modbus Plus Type III PCMCIA Card	1	416 NHM 212 33	–
Modbus Plus Type III PnP PCMCIA Card	1	416 NHM 212 34	–

**Modbus Plus products, cables and accessories (continued)****Cables**

Description	Lenght in m (ft)	References	Weight kg (lb)
Standard Modbus Plus Cable	30.5 (100)	490 NAA 271 01	–
	152.5 (500)	490 NAA 271 02	–
	305 (1000)	490 NAA 271 03	–
	457 (1500)	490 NAA 271 04	–
	1525 (5000)	490 NAA 271 06	–
Modbus Programming Cable	3.7 (12)	990 NAA 263 20	–
	15 (50)	990 NAA 263 50	–
Modbus Plus Ruggedized Tap Programming Cable	3.05 (10)	990 NAA 215 10	–
Modbus Plus Drop Cable	2.4 (8)	990 NAD 211 10	–
	6 (20)	990 NAD 211 30	–
Modbus Plus RS 485 cable	25 cm (10 in)	170 MCI 020 10	–
	1 (3)	170 MCI 020 36	–
Modbus Plus RS 485 master Communication Cable (RJ45/RJ45)	0.3 (1)	170 MCI 041 10	–
Modbus Plus RJ45 cable	3 (10)	170 MCI 021 20	–
Modbus Plus RJ45 cable, double-ended	3 (10)	170 MCI 021 80	–
	10 (30)	170 MCI 020 80	–
Modbus RS 232 Communication Cable (RJ45/RJ45)	1 (3)	110 XCA 282 01	–
	3 (10)	110 XCA 282 02	–
	6 (20)	110 XCA 282 03	–

**Accessories**

Description	Type	References	Weight kg (lb)
Modbus Plus wiring terminal insertion tool	–	043 509 383	–
Field I/O Connector	Base unit	140 XTS 002 00	–
Field I/O Connector IP 20 Finger safe	IP 20 rated	140 XTS 001 00	–
Field Power Connector	IP 20 rated	140 XTS 005 00	–
Modbus Plus D-shell Adapter for AT serial port	RJ45 to 9-pin, adapter for AT serial port	110 XCA 203 00	–
Modbus Plus D-shell Adapter for XT serial port	RJ45 to 25-pin D shell adapter for XT serial port	110 XCA 204 00	–
RJ crimping tool	–	170 XTS 023 00	–
Ground Clamp	–	424 244 739	–

### Presentation

The hot standby option provides Quantum series CPUs with the high dependability that security-critical applications demand. Central to the system is a standby controller—a second Quantum system configured identically with the primary control system with special hot standby modules mounted in both backplanes. The standby controller uses a high-speed fiber optic link to constantly maintain the current system status of the primary controller. In the event of an unexpected failure in the primary controller, system control automatically switches over to the standby controller. Critical processes running on a remote I/O network remain intact, unaffected by controller hardware failures. The result is higher productivity with reduced down-time.

At the beginning of every primary controller scan, the current register and I/O state table is transferred to the standby controller across a secure, high-speed fiber optic link. If switchover is triggered, the standby controller takes control of the system with up-to-date I/O and register status for a bumpless, controlled transfer with minimal process impact. At switchover, the standby controller becomes the primary controller and, when the downed controller is restored to good health, it becomes the standby.

Most applications demand that identical logic programs reside in the two controllers. User logic comparisons between the two controllers are performed at startup and during runtime. By default, the standby controller is taken offline if a logic mismatch is detected. You have the option to allow logic mismatches to coexist for high availability during maintenance periods. If minor process changes are required, you can make them without disturbing standby operations.

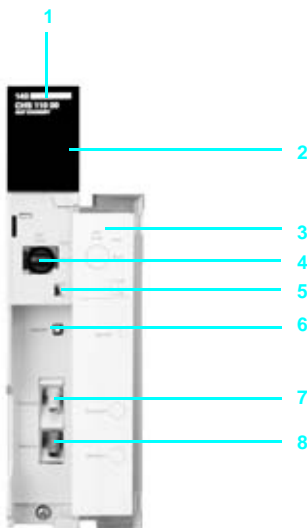
In the event that the standby controller does not have the application program, it can be copied from the primary controller. Copying the program is a simple two-step procedure that uses the keyswitch and update button on the front of the standby controller. This task can be accomplished by a maintenance person without the use of a programming panel.

For ease of ordering and installation, Schneider offers three preconfigured kits for hot standby applications. The 140 CHS 210 00 kit for open configuration includes all the products necessary to add the hot standby to an existing system. The other two kits, 140 CHS 410 10 and 140 CHS 410 20, contain hot standby, backplanes, power supplies, and Quantum controllers, so you can easily build a hot standby system from the ground up.

### Description

The Hot Standby module 140 CHS 110 00 comprises on the front panel:

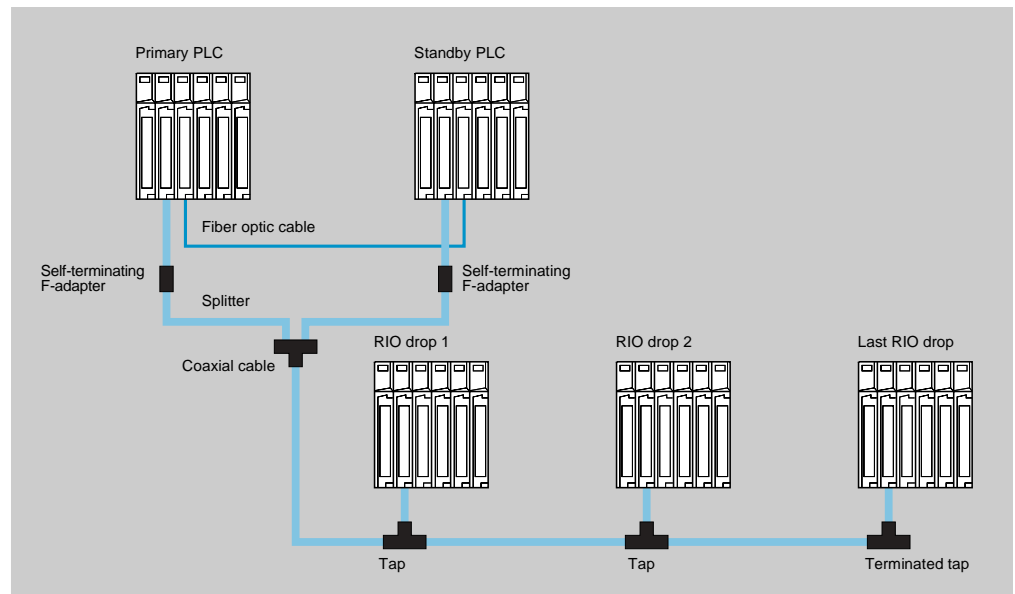
- 1 Model number and color code.
- 2 LED array.  
Ready (green) - module has completed start-up diagnostics (blinks to indicate transmission errors).  
Com Act (green) - communicating with I/O bus (blinks to indicate transmission errors).  
Primary (green) - module controls the process.  
Com Err (red) - indicates transmission errors, or connection interrupted.  
Standby (amber) - module in standby mode; blinks during the update process.
- 3 Removable, hinged door and customer identification label.
- 4 Selector switches.
- 5 Micro switch.
- 6 Update pushbutton.
- 7 Fiber optic transmit cable connector.
- 8 Fiber optic receive cable connector.



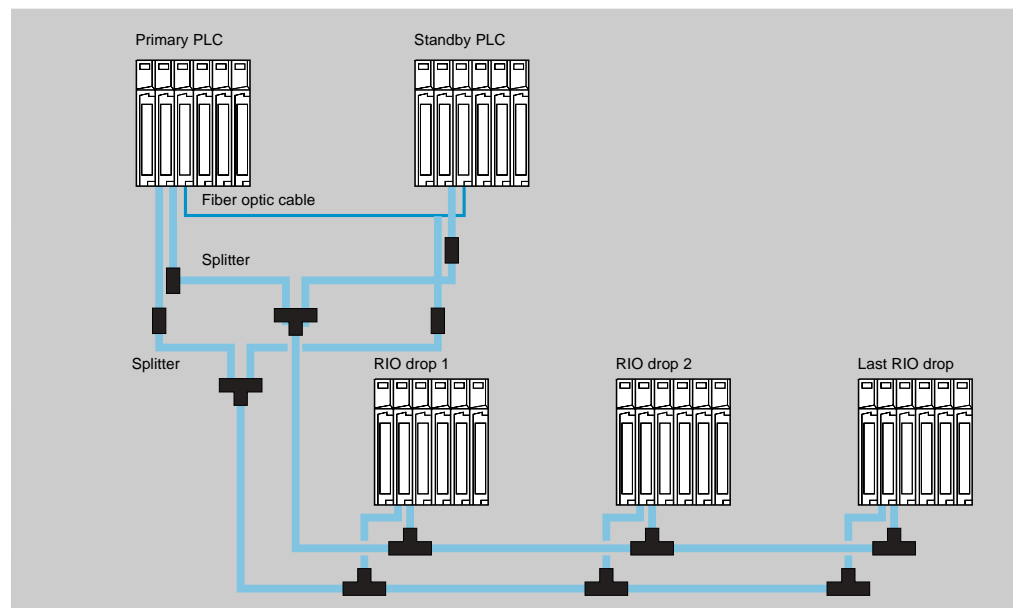
### Hot standby cable topologies

A hot standby system controls the I/O drops on a remote I/O (RIO) network. The local backplanes for the primary and standby controllers each require a Quantum CPU, an RIO head-end adapter module and a 140 CHS 110 00 Hot Standby module. Critical I/O should never be used in the local backplane because it will not be switched over when primary control shifts from one controller to the other.

The two 140 CHS 110 00 Hot Standby modules are connected to each other by a special fiber optic cable. This link allows the standby controller to maintain the current system status of the primary controller. The two RIO head-end adapter modules connect to the RIO trunk cable via an MA-0186-100 splitter.



A hot standby system can also support a redundant RIO cable topology. The coaxial cables running from the two cable ports on the 140 CRP 932 00 head-end adapters in the two controllers are connected to the redundant RIO cable by separate MA-0186-100 splitters.





Characteristics		
Model		140 CHS 110 00
Comm ports		2 connectors (transmit and receive) for fiber optic link
RFI immunity (per IEC 801-3)	MHz	27 ... 1000, 10 V/m
Bus current	mA	700 (typical)
Electrostatic discharge (per IEC 801-2)	kV	8 air, 4 contact
Compatibility	Software	ProWORX NxT V2.0 or Concept Version 2.0 and or greater
	Quantum CPUs	Version 2.0 or higher
Input/output type		Quantum, 800 Series, and Sy/Max (remote I/O only)
Fiber optic ports		1 Transmit 1 Receive
Programming software		ProWORX NxT V2.0 or Concept Version 2.0 and or greater
Quantum controllers		All, 984 ladder logic; IEC, 140 CPU 434 12A and 534 14A
CHS loadable software requirements		Version 2.0 minimum
Loadable function block performance		CHS block (Included with kit)
Switchover time	ms	13 to 48 for hot standby to assume control after primary fault detected
Scan impact communications	ms	3 + 6 per kB of configured state RAM
CHS communications rate		10 megabaud
Cable between Quantum systems	m	3 fiber optic
Current requirements	mA	700

# Quantum automation platform

## Hot standby modules

### References

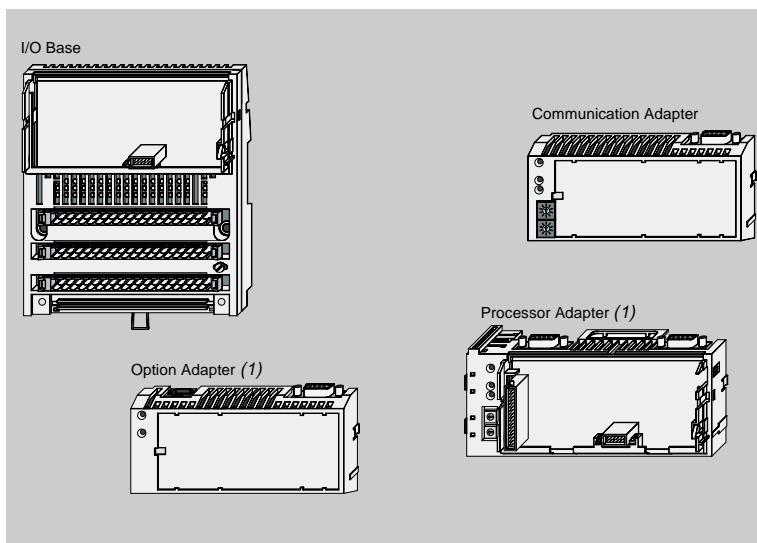
Description	Components	Reference	Weight kg (lb)
Hot Standby module	–	140 CHS 110 00	1.06 (2.33)
Hot Standby kit for open configuration	2 CHS hot standby processors 1 fiber optic (3m) hot standby cable 1 CHS loadable software package 1 S908 terminator kit CHS installation manual	140 CHS 210 00	–
Hot Standby kit for Quantum CPU 113 02	2 CHS hot standby processors 1 fiber optic (3m) hot standby cable 1 CHS loadable software package 1 S908 terminator kit CHS installation manual 2 140 XBP 006 00 backplanes 2 140 CPS 111 00 power supplies 2 140 CRP 931 01 remote I/O processors 2 Quantum CPUs, 140 CPU 113 02	140 CHS 410 10	–
Hot Standby kit for Quantum CPU 113 03	2 CHS hot standby processors 1 fiber optic (3m) hot standby cable 1 CHS loadable software package 1 S908 terminator kit CHS installation manual 2 140 XBP 006 00 backplanes 2 140 CPS 111 00 power supplies 2 140 CRP 931 01 remote I/O processors 2 Quantum CPUs, 140 CPU 113 03	140 CHS 410 20	–
User documentation	Quantum Hot Standby System Planning and Installation Guide	840 USE 106 00	–

### A modular concept with four easy pieces

The Momentum I/O system comprises 4 fundamental components that easily snap together in various combinations to form versatile distributed I/O system.

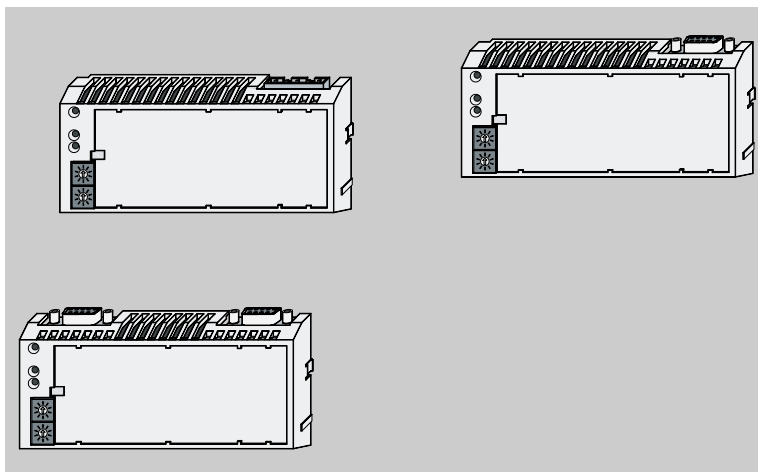
The four pieces are:

- Communication Adapters.
- I/O Base.
- Option Adapters (1).
- Processor Adapters (1).



### Momentum communication adapters

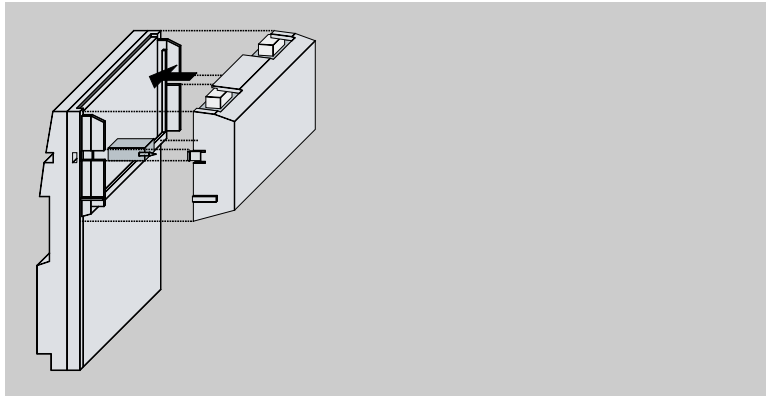
Momentum's design separates the communications from the I/O base, thus creating a truly open I/O system that can be easily adapted to any fieldbus network. When a Momentum I/O is coupled with a Communication Adapter, the two form a remote I/O drop that connects directly to virtually any standard fieldbus I/O network. Together, Momentum I/O supports control systems based on personal computers, distributed control systems, programmable controllers and Momentum processors.



(1) The Processor Adapters and Options Adapters are only compatible with the Concept and ProWORX softwares.

### Momentum I/O bases

Specialized Momentum I/O Bases support the rest of the control system. The Communication Adapters, Processor Adapters and Option Adapters all snap onto the I/O Bases. A selection of I/O base modules are available, including analog I/O, discrete I/O, multi-function analog and bi-directional discrete bases. In addition, Momentum I/O bases offer simple plug-in terminal strips, as well as standard 35 mm DIN rail or panel mounting for ease of maintenance and installation.

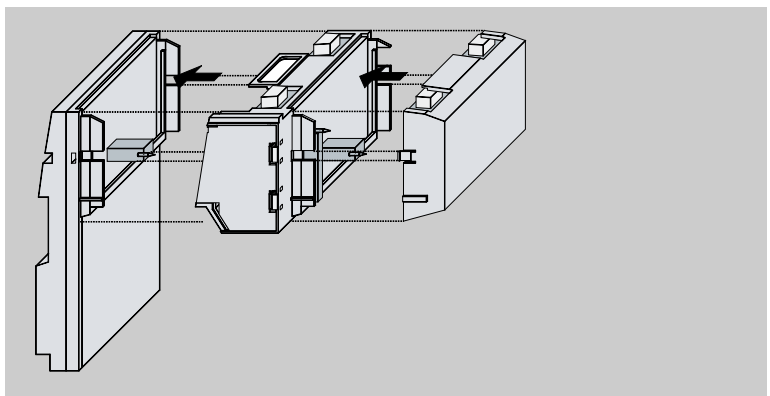


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### Momentum processors and option adapters (1)

When local distributed intelligence is required at the point of control, Momentum has the answer. Momentum M1 processor Adapters are full fledged PLCs containing a CPU, RAM and Flash memory. They are based on the popular Modicon family of PLCs (i.e., directly compatible with Quantum, Compact and 984 PLCs), and snap onto the Momentum I/O Bases, just like the communication adapters.

The Option Adapter provides the Processor Adapters with additional networking capabilities, a time-of-day clock, and a battery back-up. The Option Adapters also snap onto the I/O Base; in the figure below, the Processor Adapter is stacked on top.



(1) The Processor Adapters and Options Adapters are only compatible with the Concept and ProWORX softwares.

Product type		Input modules for direct current		Input modules for alternating current	
					
Type of signal		True high			
Operating voltage and Input voltage		24 VDC		120 VAC	230 VAC
Current consumption		Max. 250 mA		Max. 125 mA	max. 50 mA
Input type		IEC 1131 Type 1+		IEC 1131 Type 2	IEC 1131 Type 1+
Output voltage		–			
Output type		–			
Number of points		1 x 16 In	2 x 16 In	2 x 8 In	
Potential isolation	Point to point	None		None	
	Group to group	None		1780 VAC	
	Field to adapter	500 VAC		1780 VAC	
Current capacity	Per output	–			
	Per group	–			
	Per module	–			
Response time	OFF-ON	2.2 ms		10 ms @ 60 Hz	13.3 ms @ 60 Hz
	ON-OFF	3.3 ms		35 ms @ 60 Hz	13.3 ms @ 60 Hz
Protection against short circuit and overload		–			
Fault reporting	Output fault	–			
	I/O error	–			
	Blown fuse	–			
Type of module		170 ADI 340 00	170 ADI 350 00	170 ADI 540 50	170 ADI 740 50
Pages		4/35			

## Output modules for direct current



## Output modules for alternating current



24 VDC

Max. 250 mA

–

24 VDC

Solid state switch

2 x 8 out

2 x 16 out

None

None

500 VAC

0.5 A

4 A

8 A

< 0.1 ms

< 0.1 ms

Electronically safeguarded

1 LED/Out

To adapter

–

170 ADO 340 00

170 ADO 350 00

120 VAC

Max. 125 mA

120 VAC

Triac

2 x 4 out

2 x 8 out

None

None

1780 VAC

2 A

4 A

8 A

Max. 1/2 x 1/f

Max. 1/2 x 1/f

1 fuse per group

None

None

1 LED

170 ADO 530 50

170 ADO 540 50

230 VAC

Max. 65 mA

230 VAC

Triac

2 x 4 out

2 x 8 out

None

None

1780 VAC

2 A

4 A

8 A

Max. 1/2 x 1/f

Max. 1/2 x 1/f

1 fuse per group

None

None

1 LED

170 ADO 730 50

170 ADO 740 50

Product type		I/O modules for direct current			
					
Type of signal		True high		True low	True high
Input voltage		24 VDC			
Operating voltage		24 VDC			
Current consumption		Max. 250 mA			Max. 250 mA + sensor current
Input type		IEC 1131 Type 1+			
Output voltage		24 VDC			
Output type		Solid state switch			
Number of points		1 x 16 In, 2 x 8 Out			4 x 4 In, 2 x 4 Out
Potential isolation	Point to point	None			None
	Group to group	None			None
	Field to adapter	500 VAC			500 VAC
Current capacity	Per output	0.5 A			2 A
	Per group	4 A			8 A
	Per module	8 A			16 A
Response time	OFF-ON	2.2 ms In, < 1 ms Out	60 μs in, < 1 ms Out	2.2 ms In, < 1 ms Out	
	ON-OFF	3.3 ms In, < 1 ms Out	80 μs in, < 1 ms Out	3.3 ms In, < 1 ms Out	
Protection against short circuit and overload		Electrically safeguarded outputs			Electrically safeguarded outputs and 4 electronically safeguarded sensor supply group
Fault reporting	Output fault	1 LED/Out			
	I/O error	To adapter			
	Blown fuse	—			
Type of module		170 ADM 350 10	170 ADM 350 11	170 ADM 350 15	170 ADM 370 10
Pages		4/35			

## I/O modules for direct and alternating current



True high

120 VAC

120 VAC

Max. 180 mA

Max. 250 mA

Max. 160 mA

IEC 1131 Type 1+, monitored

IEC 1131 Type 1+

IEC 1131 Type 2

24...230 VAC or 20...115 VDC

120...132 VAC

Relay (normally open)

Triac

1 x 16 In, 1 x 8 Out and 1 x 4 Out

1 x 10 In, 2 x 4 Out

1 x 10 In, 1 x 8 Out

None

None

1780 VAC

None

None

None

1780 VAC

None

500 VAC

500 VAC

500 VAC

1780 VAC

0.5 A

2 A ohmic load

0.5 A

4 A group 1, 2 A group 2

8 A ohmic load

2 A

6 A

16 A ohmic load

4 A

2.2 ms In, < 10 ms Out

Max 1/2 x 1/f

3.3 ms In, < 10 ms Out

Max 1/2 x 1/f

Electronically safeguarded outputs

None

Varistor in parallel with each contact

1 internal fuse per group  
(not against overload)

1 LED/In, 1 LED/Out

None

None

To adapter

None

None

–

–

1 LED/fuse

170 ADM 390 10

170 ADM 390 30

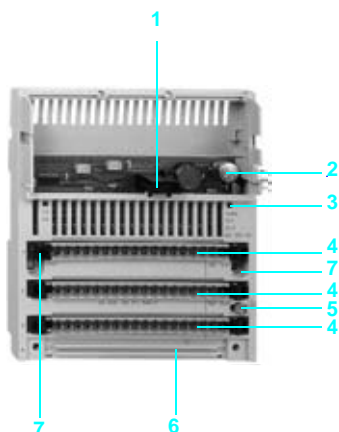
170 ARM 370 30

170 ADM 690 51

4/35

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### Presentation

The Momentum Automation Platform products are modular. Communication Adapters and Processor Adapters are designed to work as functional modules when they are snapped onto a Momentum I/O base. An I/O base requires some type of Momentum Adapter assembled on it before it can be functional.

The I/O bases fit into compact standard housings that can be mounted on a DIN rail or on panels in a cabinet. They read information from field sensing devices and control discrete and analog field actuating devices. Terminal blocks and bus bars are available for use with the bases so that they can be used to support 2-, 3-, and 4-wire field devices.

The I/O field devices and the power supply to the module are connected via three 18-pin terminal blocks and an optional 1-, 2-, or 3-row busbar. The terminal connectors are electrically connected to the module; the optional busbars not.

Busbars provide a common connection for the field devices and serve as protective distribution connectors. Depending on the I/O base and the type and number of field devices to which it is connected, a 1-, 2-, or 3-row busbar may be used.

Terminal blocks and busbars are ordered separately, and are not shipped with the Momentum I/O bases. They are available in either screw-in or spring-clip versions.

### Description

**170 AD●** discrete I/O base units comprise on the front panel :

- 1 An internal interface connector for the communication module or processor module.
- 2 A locking and earth contact for the communication module or processor module.
- 3 LED status indicators (the number of indicators will depend on the number of channels).
- 4 Three connectors for the removable terminal blocks.
- 5 An earthing screw.
- 6 A slot for the power strip.
- 7 Two holes for panel mounting.

Connectors to be ordered separately :

- removable screw or spring terminals **170 XTS 00● 00**
- 1 to 3-row screw or spring bus bar **170 XTS 00● 01**.

### Characteristics of discrete input bases

Type of input base unit			170 ADI 340 00	170 ADI 350 00	170 ADI 540 50	170 ADI 740 50
Number of inputs			1 x 16	2 x 16	2 x 8	
Input voltage	V		24 DC		120 AC	230 AC
Operating voltage	V		24 DC		85...132 AC (@ 47...63 Hz)	164...253 AC (@ 47...63 Hz)
Internal current	mA		250 (@ 24 VDC)		125 (@ 120 VAC)	125 (@ 230 VAC)
Input voltage range	V		- 3...30 DC		0...132 AC	163...253 AC
	ON voltage	V	+ 11...30 DC		74 AC minimum	164 AC minimum
	OFF voltage	V	- 3...+ 5 DC		20 AC maximum	40 AC maximum
Input current	ON	mA	2.5 minimum		10.0 minimum	3...15
	OFF	mA	1.2 maximum		2.0 maximum	0...15
Input resistance	kΩ		4		9.5 @ 50 Hz 7.5 @ 60 Hz	9 @ 50 Hz 7.5 @ 60 Hz
Type of signal			True High			
Response time	On-off maximum	ms	3.3		35.0 @ 60 Hz	13.3 @ 60 Hz
	Off-on maximum	ms	2.2		10.0 @ 60 Hz	13.3 @ 60 Hz
Potential isolation	Group to group	V	–			1780 AC
	Field to communication interface	V	500 AC			1780 AC
Power dissipation	W		3 typical, 5 maximum	5.5 typical, 8.5 maximum	–	
Agency approvals			UL, C€, CSA, FM Class I, Div. II	UL, C€, CSA	UL, C€, CSA, FM Class I, Div. II	UL, C€, CSA

### Characteristics of discrete output bases

Type of output base unit			170 ADO 340 00	170 ADO 350 00	170 ADO 530 50	170 ADO 540 50	170 ADO 730 50	170 ADO 740 50
Number of outputs			2 x 8	2 x 16	2 x 4	2 x 8	2 x 4	2 x 8
Type of output			Solid state switch		Triac			
Output voltage	V		24 DC		120 AC		230 AC	
Operating voltage	V		24 DC		120 AC (300 for 10 s, 400 for 1 cycle)		230 AC (300 for 10 s, 400 for 1 cycle)	
Internal current	mA		250 (@ 24 VDC)		125		65	
Current	Point maximum	A	0.5	0.5	2	0.5	2	0.5
	Group	A	4	8	4			
	Module	A	8	16	8			
Min. output current	mA		–		5	30	5	30
Leakage current	mA		< 1 @ 24 VDC		1.9 @ 120 VAC		2.5 @ 230 VAC	2.4 @ 230 VAC
Surge current	A		5 for 1 ms		Point: 15 (1 cycle), 10 (2 cycles), 5 (3 cycles)			
On State Voltage drop	V		< 0.5 DC @ 0.5 A		< 1.5 AC @ 2 A	< 1.5 AC @ 0.5 A	< 1.5 AC @ 2 A	< 1.5 AC @ 0.5 A
Protection (short-circuits, overloads)			Outputs electronically protected		Via internal 5 A slow-blow fuse per group			
Response time	On-off maximum	ms	< 0.1		1/2 x 1/f (= 0,5 of one line cycle)			
	Off-on maximum	ms	< 0.1		1/2 x 1/f (= 0,5 of one line cycle)			
Potential Isolation	Output group to output group		None		None			
	Field to communication interface	V	500 AC		1780 AC			
Power dissipation	W		3.5 typical 4.5 maximum	6.0 typical 7.5 maximum	6.0 typical 7.5 maximum			
Agency approvals			UL, C€, CSA	UL, C€, CSA	UL, C€, CSA, FM Class I, Div. II			

## Characteristics of discrete I/O bases (continued)

Type of base unit			170 ADM 350 10	170 ADM 350 11	170 ADM 350 15	170 ADM 370 10	170 ADM 390 10	
Number of inputs			1 x 16			4 x 4	1 x 16	
Number of outputs			2 x 8			2 x 4	1 x 8 and 1 x 4	
Operating voltage			--- V	24				
Internal current			mA	250 @ --- 24 V			250 @ --- 24 V (plus current for sensors)	180 @ --- 24 V
Inputs	Voltage	--- V	24					
	Type of signal		True high			True low	True high	
	Voltage at 1	--- V	+ 11...+ 30			- 3...+ 5	+ 11...+ 30	
	Voltage at 0	--- V	- 3...+ 5			+ 4...+ 30	- 3...+ 5	
	Input current	mA	2.5 min. at state 1 (6 mA @ --- 24 V),1.2 max. at state 0					
	Input voltage range	--- V	- 3...+ 30					
	Input resistance	kΩ	4					
	Response time	ms	2.2 Off to on 3.3 On to off	0.06 Off to on 0.08 On to off	2.2 ms In, < 1 ms Out 3.3 ms In, < 1 ms Out			
	Fault sensing		–					Broken wire detection
Outputs	Voltage	--- V	24, 30 maximum					
	Type		Solid state switch					
	Type of signal		True high			True low	True high	
	Current capacity	A	0.5 per point 4 per group 8 per module			2 per point 8 per group 16 per module	0.5 per point 4 per group 1, 2 group 2 6 per module	
	Leakage current	mA	< 1 @ --- 24 V			< 1 @ --- 24 V	< 1 @ --- 24 V	
	Peak current	A	5 for 1 ms			2.8 for 1 ms	–	
	On state voltage drop	--- V	< 0.5 @ 0.5 A			–	–	
	Error indication		Output overload for at least one output to communication adapter			Output overload for at least one output or short-circuit or overload on one of the 4 encoder supply groups, to communication adapter	Output overload for at least one output to communication adapter	
	Response time	ms	< 0.1 Off to On, < 0.1 On to Off					
Potential isolation	Input to input		None					
	Output to output group		None					
	Input to output group		None					
	Field to communication interface	V	500 AC					
Power dissipation	Typical	W	6.0			6.5		
	Maximum	W	8.0			10.0		
Agency approvals			UL, C€, CSA					UL, C€, CSA, FM Class I, Div. II

**Characteristics of discrete I/O bases** (continued)

Type of base unit			170 ADM 390 30	170 ARM 370 30	
Number of inputs			1 x 10		
Number of outputs			2 x 4		
Operating voltage			V	24 DC	120 AC (47...63Hz)
Internal current			mA	250 (@ 24 VDC)	5 minimum load current
Inputs	Voltage	V	24 DC		
	Signal type		True High		
	On voltage minimum	VDC	+ 11...+ 30		
	Off voltage maximum	VDC	- 3...+ 5		
	Input current	mA	2.5 minimum On, 1.2 maximum Off		
	Input voltage range	VDC	- 3...+ 30		
	Input resistance	kΩ	4		
	Response time	ms	2.2 Off to On, 3.3 On to Off		
Outputs	Voltage	V	24...230 AC, 20...115 DC		
	Type		Relay normally open		
	Current capacity 24 VDC	A	> 0.005 (new contacts), ohmic load 2 A maximum, inductive load 1 A maximum (LR ≤ 40 ms)		
	Current capacity 115 VDC	A	Ohmic load 0.5 A maximum (switching current ≤ 1.5 A), inductive load 0.15 A maximum (LR ≤ 40 ms)		
	Current capacity VAC	A	2 A maximum (switching current ≤ 1.5 A) cosφ = 1 , 1 A maximum cosφ = 0.5	2 A per point, 8 A per group, 16 A per module	
	Leakage current	mA	< 1 @ 230 VAC	–	
	Error indication		None		
	Response time	ms	10 @ 60 Hz Off to On, 10 @ 60 Hz On to Off		
	Max. number of switching circuits		> 30 x 10 <sup>6</sup> (mechanical), > 1 x 10 <sup>5</sup> (inductive load with external protection circuit)		
	Protection against short circuit and overload		None	Varistor in parallel with each contact	
Potential isolation	Input to Input		None		
	Output group to output Group	V rms	None	1780 AC	
	Input to output group	V rms	None	1780 AC	
	Field to communication interface	V rms	500 AC	500 AC	
Fusing	Internal		None		
	External operating voltage		315 mA fast-blow	4 A fast-blow	
	External input voltage		max. 4 A fast-blow	None	
	External output voltage		According to the supply of the connected actuators not to exceed 8 A slow-blow/ group	None	
Power dissipation	Typical	W	5.5		
	Maximum	W	8.5		
Agency approvals			UL, C€, CSA		

Characteristics of discrete I/O bases (continued)			
Type of base unit		170 ADM 690 51	
Number of inputs			1 x 10
Number of outputs			1 x 8
Operating voltage		VAC	120 (47...63 Hz)
Internal current		mA	160 (@ 120 VAC)
Inputs	Voltage	VAC	120
	Signal type		True high
	On voltage minimum	VAC	74
	Off voltage maximum	VAC	20
	Input current	mA	6.0 minimum at state 1, 2.6 maximum at state 0
	Input voltage range	VAC	74...132
	Input resistance	kΩ	4
	Response time	ms	Maximum 1/2 x 1/f Off to On, maximum 1/2 x 1/f On to Off
Outputs	Voltage	VAC	120...132 (@ 47...63 Hz)
	Type		Triac
	Current capacity		0.5 A per point maximum, 30 mA per point minimum, 4 A per module
	Leakage current	mA	< 1.3 (@ 120 VAC)
	Signal type		True High
	On state voltage drop	VAC	< 1.5 (@ 0.5 A)
	Error indication		None
	Response time	ms	1/2 x 1/f maximum from state 0 to state 1, 1/2 x 1/f maximum from state 1 to state 0
	Maximum switching cycles		3000/hr for 0.5 A inductive load
Potential Isolation	Input to input		None
	Output group to output group		None
	Input to output group	VAC	None
	Field to communication interface	VAC	1780 AC
Power dissipation	Typical	W	6
	Maximum	W	8
Protection	Internal fuses	A	2 x 2.5 slow-blow fuses
Agency approvals			UL, C€, CSA

### Discrete input bases



170 ADI ●●● ●0

Type of current	Input voltage	Modularity (no. of points)	Conformity EC 1131-2	Reference	Weight kg
DC	24 V	16 (1 x 16)	Type 1	<b>170 ADI 340 00</b>	0.190
		32 (2 x 16)	Type 1	<b>170 ADI 350 00</b>	0.200
AC	120 V	16 (2 x 8)	Type 2	<b>170 ADI 540 50</b>	0.284
	230 V	16 (2 x 8)	Type 2	<b>170 ADI 740 50</b>	0.284

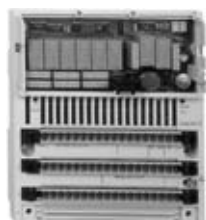
### Discrete output bases



170 ADO ●●0 ●0

Type of current	Output voltage	Modularity (no. of points)	Current per output	Reference	Weight kg
DC solid state, protected	24 V	16 (2 x 8)	0.5 A	<b>170 ADO 340 00</b>	0.210
		32 (2 x 16)	0.5 A	<b>170 ADO 350 00</b>	0.210
AC triac, protected, 1 fuse per group	120 V	8 (2 x 4)	2 A	<b>170 ADO 530 50</b>	0.320
		16 (2 x 8)	0.5 A	<b>170 ADO 540 50</b>	0.284
	230 V	8 (2 x 4)	2 A	<b>170 ADO 730 50</b>	0.320
		16 (2 x 8)	0.5 A	<b>170 ADO 740 50</b>	0.284

### Discrete I/O bases



170 ADM ●●0 ●●

Type of current	Input voltage	Output voltage	Modularity Input	Outputs, current	Reference	Weight kg
DC solid state	24 VDC Type 1	24 VDC protected	16 I (1 x 16)	16 O (2 x 8) 0.5 A	<b>170 ADM 350 10</b>	0.200
			16 I, fast (1 x 16)	16 O (2 x 8) 0.5 A	<b>170 ADM 350 11</b>	0.200
			16 I (1 x 16)	16 O (2 x 8) 0.5 A	<b>170 ADM 350 15</b>	0.200
			16 I (4 x 4)	8 O (2 x 4) 2 A	<b>170 ADM 370 10</b>	0.220
			16 I, wiring check (1 x 16)	12 O (1 x 8) 0.5 A, (1 x 4) 2 A	<b>170 ADM 390 10</b>	0.260
AC or DC relay	24 VDC Type 1	24/230 VAC 20/115 VDC	10 I (1 x 10)	8 O (2 x 4) 2 A	<b>170 ADM 390 30</b> (1)	0.260
					<b>170 ARM 370 30</b> (2)	0.260
AC triac	100...120 VAC Type 2	120 VAC	10 I (1 x 10)	8 O (1 x 8) 0.5 A protected by 1 fuse	<b>170 ADM 690 51</b>	0.220

(1) Operating voltage 24 VDC.  
(2) Operating voltage 120 VAC.



170 XTS 001 00



170 XTS 002 00



170 XTS 004 01



170 XTS 005 01



170 XTS 008 01



170 XTS 006 01



CER 001



170 BSM 016 00

References

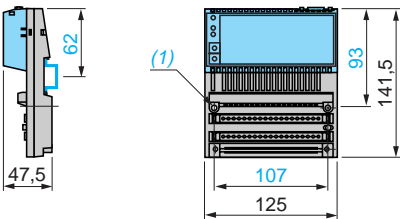
Accessories				
Description	Composition	Type of connection	Reference	Weight kg
Terminal blocks for I/O base connection	Set of 3 connectors 1 row	Screw	170 XTS 001 00	–
		Spring	170 XTS 002 00	–
Bus Bar	3 rows	Screw	170 XTS 004 01	–
		Spring	170 XTS 003 01	–
	2 rows	Screw	170 XTS 005 01	–
		Spring	170 XTS 008 01	–
	1 row	Screw	170 XTS 006 01	–
		Spring	170 XTS 007 01	–
Cable grounding rail	Used to connect the cable shielding	–	CER 001	–
High vibration environment clips	Kit containing 5 sets of clips	–	170 XTS 120 00	–
Dummy base unit	Used to prewire the I/O base units Requires screw or spring connection terminals	–	170 BDM 090 00	–
Discrete input simulator, 16 channels, 24 VDC	–	–	170 BSM 016 00	–

Replacement parts

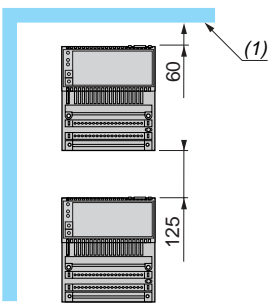
Description	Use	Reference	Weight kg
Sheets of labels	10 front labels for Momentum modules	170 XTS 100 00	–
Cable coding part kit	For screw or spring connection terminals	170 XCP 200 00	–

Dimensions, mounting

170 AD●, rail or panel mounting



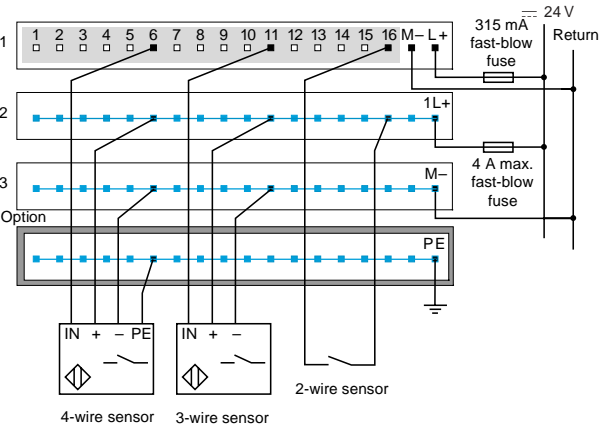
(1) 2 holes for M4 screws, for panel mounting



(1) Equipment or enclosure

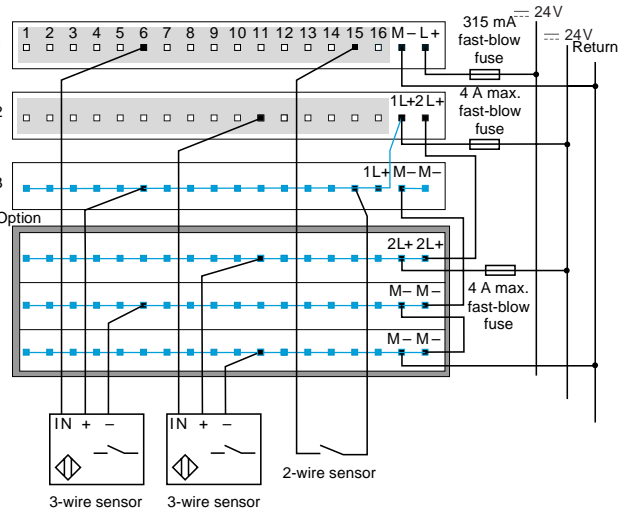
170 ADI 340 00

Example of external wiring of 2, 3 and 4-wire sensors



170 ADI 350 00

Example of external wiring of 2 and 3-wire sensors



Group of channels

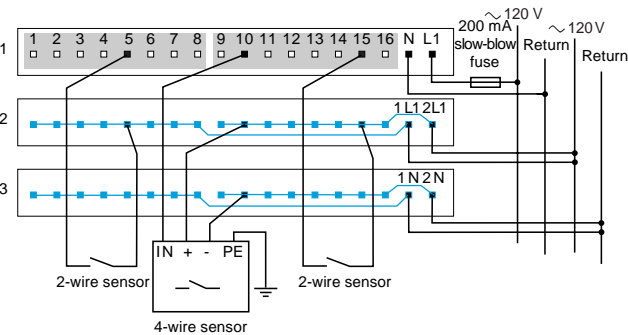
Internal wiring

Group of channels

Internal wiring

170 ADI 540 50

Example of external wiring of 2 and 3-wire sensors

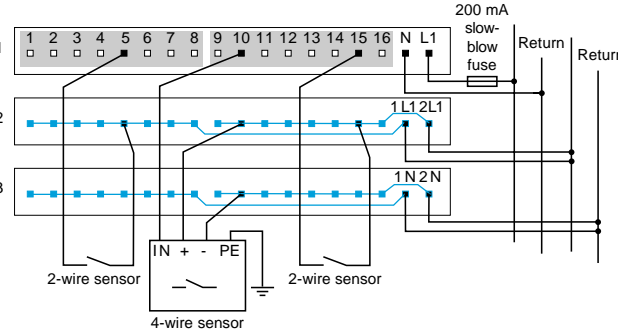


Group of channels

Internal wiring

170 ADI 740 50

Example of external wiring of 2 and 3-wire sensors



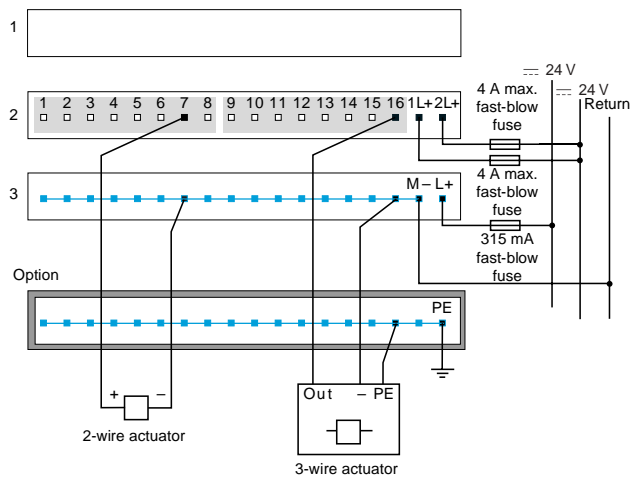
Group of channels

Internal wiring



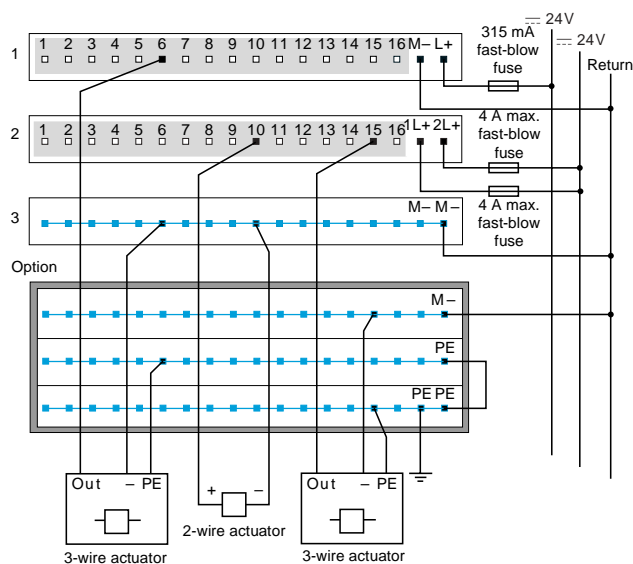
### 170 ADO 340 00

Example of external wiring of 2 and 3-wire actuators



### 170 ADO 350 00

Example of external wiring of 2 and 3-wire actuators



Group of channels

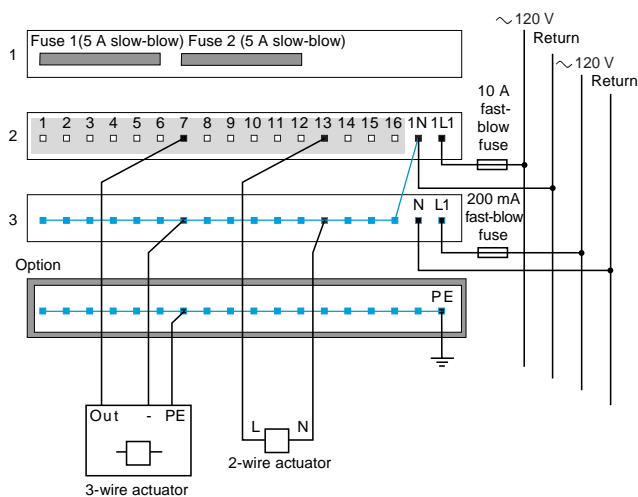
Internal wiring

Group of channels

Internal wiring

### 170 ADO 540 50

Example of external wiring of 2 and 3-wire actuator

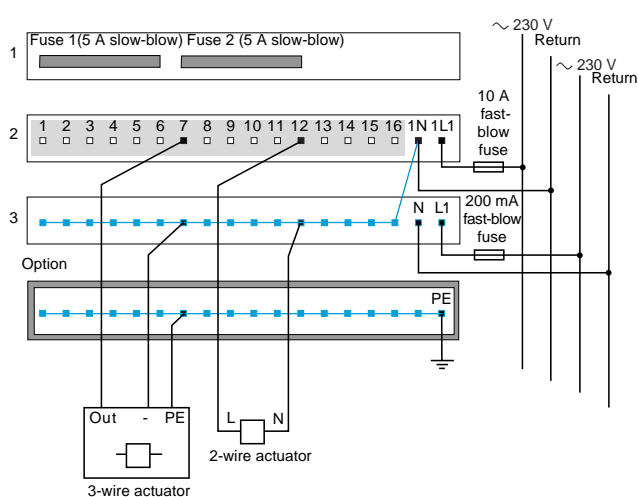


Group of channels

Internal wiring

### 170 ADO 740 50

Example of external wiring of 2 and 3-wire actuators

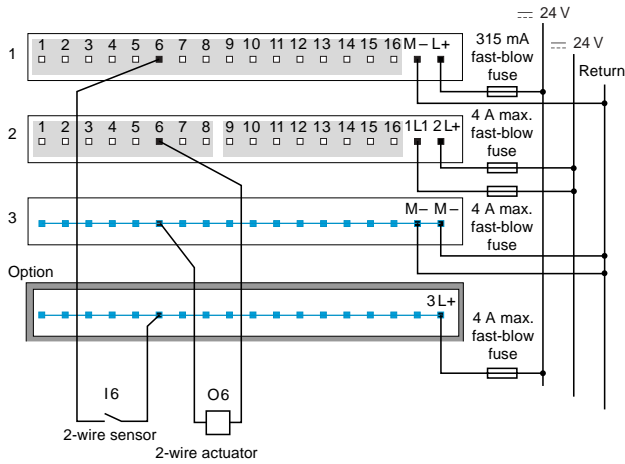


Group of channels

Internal wiring

170 ADM 350 10/350 11/350 15

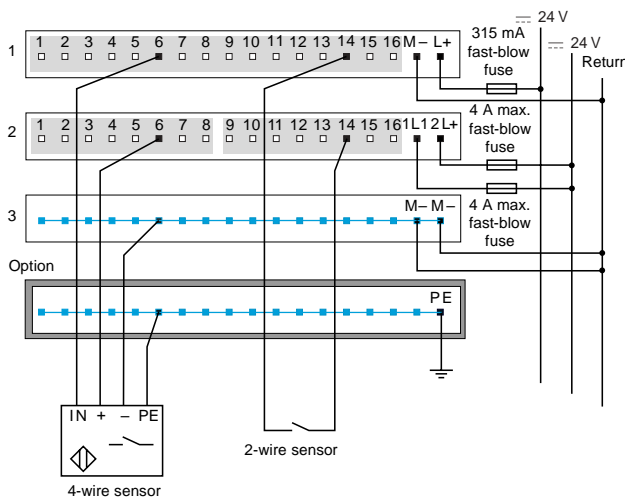
Example of external wiring of a 2-wire sensor/actuator



Group of channels

Internal wiring

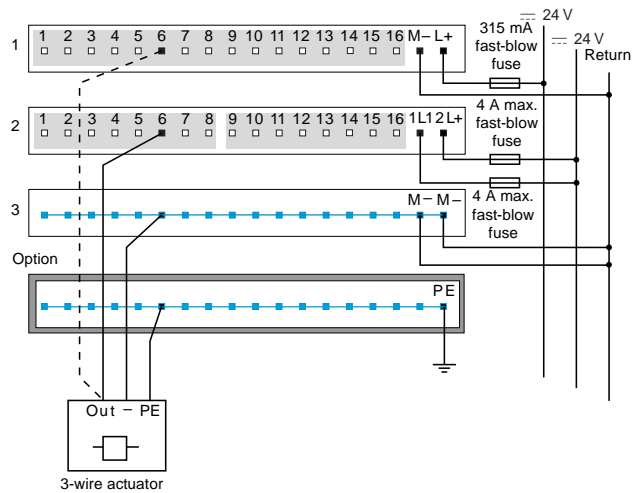
Example of external wiring of a 4-wire sensor activated by an output



Group of channels

Internal wiring

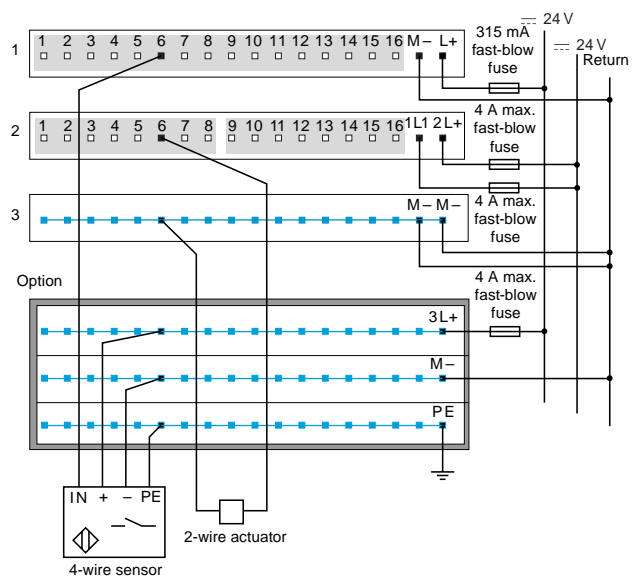
Example of external wiring of a 3-wire actuator with wiring check



Group of channels

Internal wiring

Example of external wiring of a 4-wire sensor/2-wire actuator

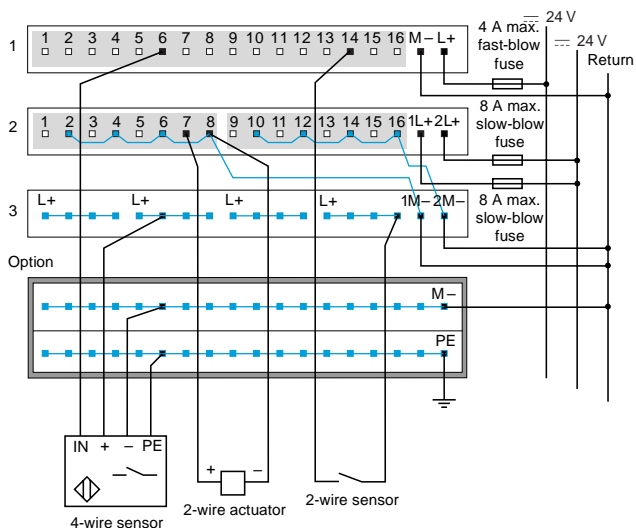


Group of channels

Internal wiring

### 170 ADM 370 10

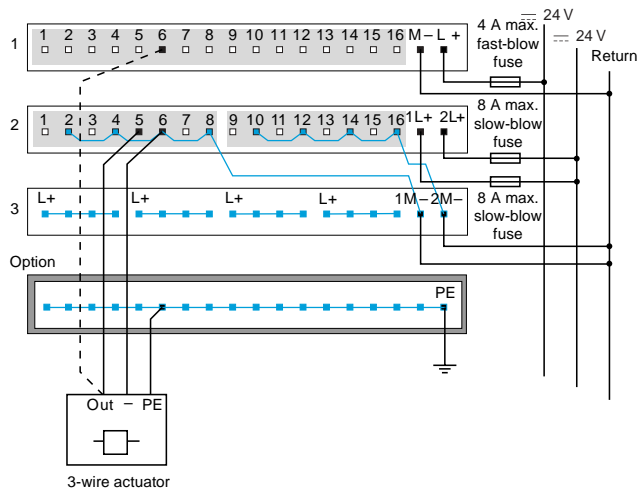
#### Example of external wiring of 2 and 4-wire sensors/2-wire actuator



Group of channels

Internal wiring

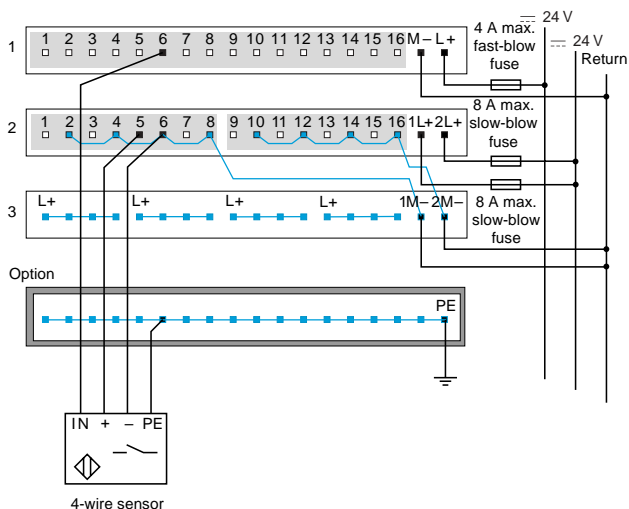
#### Example of external wiring of 3-wire actuator with wiring check



Group of channels

Internal wiring

#### Special external wiring, the output activates the sensor

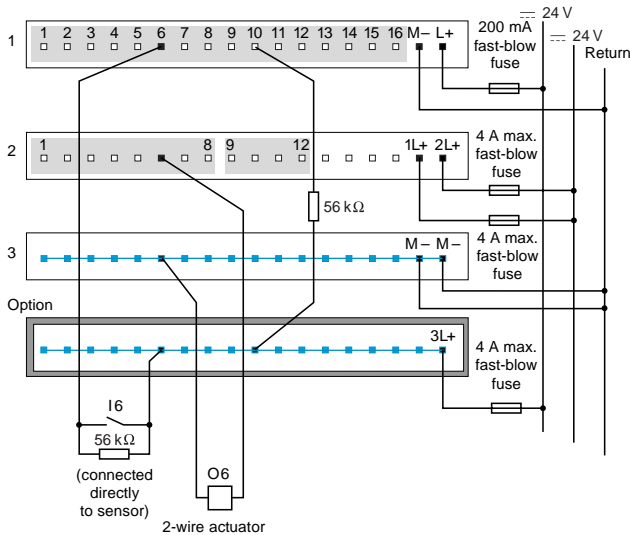


Group of channels

Internal wiring

### 170 ADM 390 10

Example of external wiring of 2-wire sensor/actuator

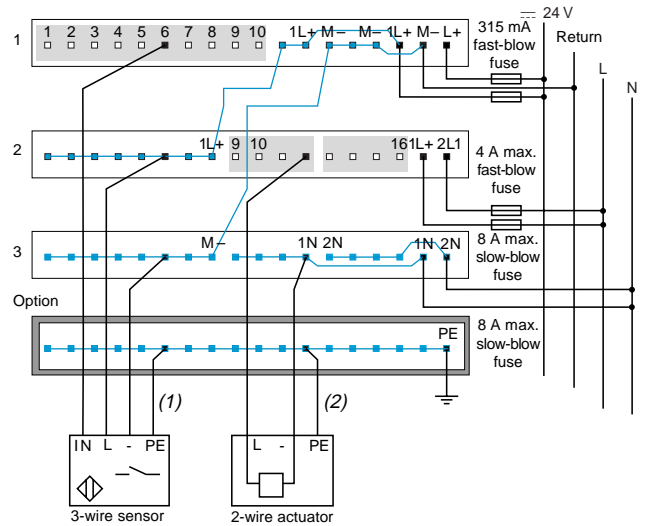


Group of channels

Internal wiring

### 170 ADM 390 30

Example of external wiring of 3 or 4 sensor/3-wire/actuator



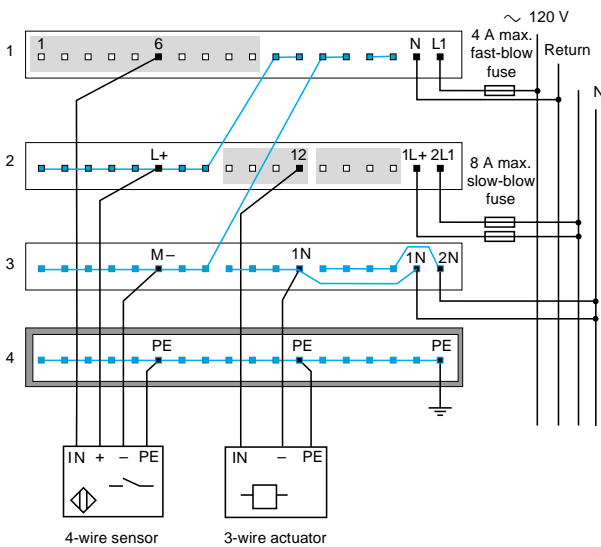
Group of channels

Internal wiring

(1) For 4-wire sensor  
(2) For 3-wire actuator

### 170 ARM 370 30

Example of external wiring of 4-wire sensor/3-wire actuator

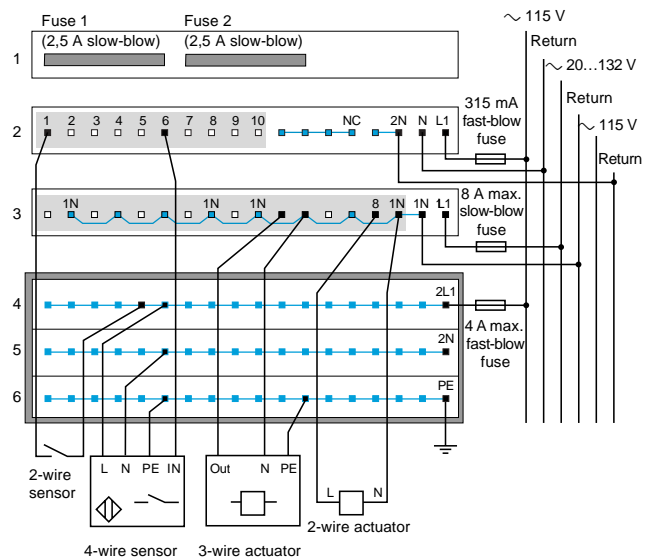


Group of channels

Internal wiring


### 170 ADM 690 51

Example of external wiring of 4-wire sensor/2 and 3-wire actuators



Group of channels

Internal wiring

Applications		24 VDC analog input bases		
				
Operating voltage		24 VDC		
Measurement range		Inputs ± 5 V, ± 10 V, ± 20 mA 1-5 V, 4-20 mA	Inputs ± 5 V, ± 10 V, 4-20 mA	Inputs ± 25 mV, ± 100 mV, Temperature probe Pt 100, Pt 1000, Ni 100, Ni 1000 Thermocouple B, E, J, K, N, R, S, T
Modularity	Input channels	8 differential inputs	16 single-ended inputs	4 differential inputs
	Output channels	—	—	—
	Discrete I/O	—	—	—
Resolution		14 bits + sign bipolar 15 bits unipolar	12 bits + sign	15 bits + sign
Update time		1.33 + 1.33 x no. of declared channels (ms)	1 + 1.5 x no. of declared channels (ms)	500 ms
Potential isolation	Between channels	200 VDC, 1 min	None	400 VDC
	Base and ground	500 VDC, 1 min	500 VDC, 1 min	500 VDC, 1 min
	Channels and ground	500 VDC, 1 min	1780 VAC, 1 min	1780 VAC, 1 min
Protection		Polarity inversion		
Number in words	In	8 words in	16 words in	4 words in
	Out	2 words out	4 words out	4 words out
Fail states		—		
Type of communicating module		170 AAI 030 00	170 AAI 140 00	170 AAI 520 40
Pages		4/50		

24 VDC analog output bases



24 VDC mixed I/O bases (analog/discrete)



Outputs  
 $\pm 10\text{ V}$ , 0-20 mA

Outputs  
 $\pm 10\text{ V}$ , 4-20 mA

Inputs  
 $\pm 5\text{ V}$ ,  $\pm 10\text{ V}$ ,  $\pm 20\text{ mA}$   
1-5 V, 4-20 mA  
Outputs  
 $\pm 10\text{ V}$ , 0-20 mA

Inputs  
0...10 V

Outputs  
0...10 V

Inputs  
- 10...+ 10 V

Outputs  
- 10...+ 10 V

—  
4 outputs  
—

4 differential inputs  
2 outputs  
4 inputs 24 VDC  
2 outputs 24 VDC/0.5 A

6 inputs with common point  
4 outputs with common point  
8 inputs 24 VDC  
8 outputs 24 VDC/0.25 A

12 bits + sign

Inputs: 12...14 bits  
(dep. on range)  
Outputs: 12 bits

Inputs: 14 bits  
Outputs: 14 bits

2 ms

Inputs: 10 ms  
Outputs: 1 ms

Inputs: 0.75 ms (for 6 inputs)  
Outputs: 1.2 ms (for 4 inputs)

None  
500 VDC, 1 min  
1780 VAC, 1 min

None  
500 VAC, 1 min  
500 VAC, 1 min

Short-circuits and overloads (for discrete outputs)

—  
5 words out

4 words in  
4 words out

12 words in  
12 words out

Hold, reset to zero, reset to full scale

Hold or reset to zero

170 AAO 120 00

170 AAO 921 00

170 AMM 090 00

170 ANR 120 90

170 ANR 120 91

### Presentation

The Momentum analog input bases enable acquisition of various analog values encountered in industrial applications, including:

- Standard high level (1-5 V, 4-20 mA,  $\pm 5$  V,  $\pm 10$  V,  $\pm 20$  mA).
- Low level ( $\pm 25$  mV,  $\pm 100$  mV).
- Thermocouples (B, E, J, ...).
- Temperature probes (Ni ..., Pt ...).

The analog output bases are used to control analog field devices such as various speed drives, proportional control valves, etc. The current or the voltage is proportional to the digital value defined by the user program. The outputs can be configured so that when the program stops the outputs either reset to zero or hold the last value received. This feature is useful during debugging since, if the outputs are set to "Hold", the operation of the analog field devices is not disturbed every time the program stops.

In order to cover a wide range of applications, Momentum I/O bases offer the following functions in addition to A/D or D/A conversion:

- Choice of input/output ranges (voltage, current, thermocouple, temperature probes).
- Selection of number of channels used.
- Cold junction compensation for thermocouple modules.
- Broken wire detection (170 AAI 030 00, 170 AAI 140 00, 170 AAI 520 40).

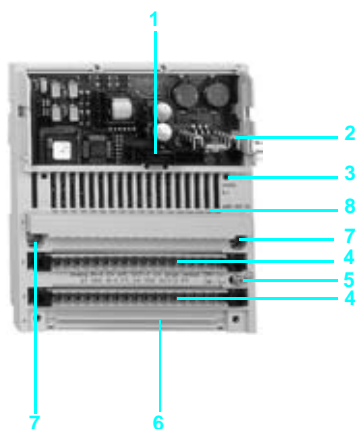
### Description

**170 A●●** analog I/O base units comprise on the front panel:

- 1 Internal interface connector for the communication module or processor module.
- 2 A locking and earth contact for the communication module or processor module.
- 3 LED status indicators (the number of indicators will depend on the number of channels).
- 4 Two connectors for the removable terminal blocks.
- 5 An earthing screw.
- 6 A slot for the power strip.
- 7 Two screw holes for panel mounting.
- 8 A protective cover.

Connectors to be ordered separately :

- Removable screw or spring terminal blocks **170 XTS 00● 00**.
- 1 to 3-row screw or spring bus bar **170 XTS 00● 01**.



Characteristics of analog input bases							
Type of base units			170 AAI 030 00				
Number of inputs			1 x 8 differential inputs				
LEDs			Ready (green)				
Format of data			Full 16 bits signed (2's complement)				
Protection	Base and actuators		Polarity inversion				
Ranges	Input impedance	kΩ	± 10 VDC > .1000	± 5 VDC > .1000	4...20 mA 250	± 20 mA 250	1...5 VDC > .1000
	Error at 25 °C (% of full scale)	%	0.27	0.21	0.27	0.32	0.13
	Error at 60 °C (% of full scale)	%	0.32	0.26	0.38	0.41	0.19
	Resolution		14 bits + sign bipolar 15 bits unipolar				
Conversion times		ms	12 ms max. for 8 input channels (1.33 ms per input channel + 1.33 ms)				
Error indication			None				
Isolation	Channel to channel	VDC	± 200, 1 min				
	Field to ground	VDC	500, 1 min				
	Comm adapter to ground	VAC	500, 1 min				
Common mode rejection	Channel to ground		250 VAC @ 47...63 Hz or 100 VDC				
Crosstalk between channels		dB	≥ 80				
External power requirement	Range	VDC	24				
		VDC	20.4 to 28.8				
	Current	mA	< 382 @ 24 VDC				
EMC for industrial environment	Immunity		IEC 1131 surge on auxiliary power supply 2 kV				
	Emissions		EN 50081-2				
	Approvals		UL, CSA, C€				



### Characteristics of analog input bases (continued)

Type of base units			170 AAI 140 00			170 AAI 520 40	
Number of inputs			1 x 16 single-ended input			1 x 4 differential inputs	
Format of data			Full 16 bits signed (2's complement)				
Protection	Base and actuators		Polarity inversion				
Error indication			None				
Ranges	Input impedance	kΩ	± 10 V	± 5 V	4...20 mA	± 25 mV	± 100 mV
			> 2200	> 2200	< 0.250	> 10000	> 10000
	Error at 25 °C (% of full scale)		0.15	0.15	0.25	0.08	0.03
	Error at 60 °C (% of full scale)		0.25	0.25	0.45	0.18	0.09
	Resolution		12 bits + sign	12 bits + sign	12 bits	15 bits + sign	
	Filtering		Low pass with cut-off frequency 10 kHz			–	
Current source	Pt100	mA	–			–	0.125
	Ni100	mA	–			–	0.125
	Pt1000	mA	–			0.125	–
	Ni1000	mA	–			0.125	–
Update time		ms	1 + 1.5 x n n = number of declared channels			500	
Error indication			None				
Potential isolation	Channel to channel	VDC	None			400	
	Base power supply and Ground	VDC	500, 1 min			500, 1 min	
	Channels to ground	VAC	1780, 1 min			1780, 1 min	
	Base power	V	± 30 (voltage or current output)			± 30 (voltage or current output)	
	Common mode Channel to ground	V	–			± 100 DC, 250 AC	
	Common mode Voltage betw.channels	V	–			200 DC, 115 AC single phase or 3-phase or 250 AC single phase	
Common mode rejection	Channel to ground		250 VAC at 47...63 Hz or 100 VDC			135 dB DC, 145 dB AC 50 Hz, 155 dB AC 60 Hz	
	Between channels		–			120 dB DC, 130 dB AC 50 Hz, 140 dB AC 60 Hz	
Serial mode rejection			–			35 dB AC 50 Hz, 45 dB AC 60 Hz	
Input protection			Polarity inversion				
Operating voltage		VDC	24				
Internal current		mA	305 @ 24 VDC				
Power dissipation	Typical	W	4.95			3.5	
	Maximum	W	5.55			5.5	
Fusing	Internal		2 A slow-blow			2 A slow-blow	
	External		500 mA fast-blow			500 mA fast-blow	
Agency approvals			UL, C€, CSA, FM Class I, Div. II				

## Characteristics of analog output bases

Type of base units			170 AAO 120 00		170 AAO 921 00	
Number of outputs			1 x 4			
Format of data			Full 16 bits signed (2's complement)			
Protection	Base and actuators		Polarity inversion			
Ranges			± 10 V	0...20 mA	± 10 V	4...20 mA
	Load impedance	kΩ	1 minimum	0.6 maximum	1 minimum	0.6 maximum
	Capacitive load	μF	< 1			
	Error at 25 °C (% of full scale)	%	0.2	0.3	0.2	0.4
	Error at 60 °C (% of full scale)	%	0.25	0.4	0.25	0.5
	Resolution		12 bits + sign			
	Update time	ms	< 2			
Full scale			10 V in the range of ± 10V 2 mA in the range of 0...20 mA			
Fail State			Hold, reset to zero, reset to full scale			
Potential isolation	Channel to channel		None			
	Base power supply and Ground	V	500 DC, 1 min			
	Channels to ground	V	1780 AC, 1 min			
	Output protection		Short-circuits in the voltage circuits, open in current polarity inversion			
	Base power	V	± 30 (voltage or current output)			
Common mode rejection		V	250 AC @ 47...63 Hz or 250 DC channel to ground			
Operating voltage		VDC	24			
Internal current	Base	mA	530 @ 24 VDC			
	Actuators	mA	150 @ 24 VDC			
Power dissipation	Typical	W	5.6			
	Maximum	W	8.5			
Internal fusing		A	2, slow-blow			
Agency approvals			UL, CE, CSA			

## Characteristics of discrete and analog I/O bases

Type of base unit		170 AMM 090 00					
Number of inputs and outputs			1 x 4 differential inputs 1 x 4 discrete inputs 1 x 2 analog outputs 1 x 2 discrete outputs				
Operating voltage		VDC	24				
Internal current		mA	200 typical (at 24 VDC), 350 maximum (at 24 VDC)				
Differential inputs	Conversion time		10 ms for all channels				
	Conversion error		± 10 V	± 5 V	1...5 V	± 20 mA	4...20 mA
	25 °C (% of full scale)	%	0.08	0.16	0.16	0.16	0.16
	60 °C (% of full scale)	%	0.15	0.3	0.3	0.3	0.3
	Resolution		14 bits	13 bits	12 bits	13 bits	12 bits
	Conversion consistency	%	± 0.02	± 0.04	± 0.04	± 0.04	± 0.04
	Common mode voltage		Input voltage starting at Ag ± 11 V				
	Common mode suppression	dB	> 54				
	Overvoltage Voltage ranges	V	± 30 solid state if voltage is 24 V ± 50 dynamic max. 100 ms				
	Overvoltage current ranges	mA	–				Input current > 48
	Input resistance	W	1 M				250
	Fail state		Hold, reset to zero, or reset to full scale				
Discrete inputs	Voltage	VDC	24 typical, 30 maximum				
	Signal Type		True high				
	On Voltage	VDC	+ 11...+ 30				
	Off Voltage	VDC	- 3...+ 5				
	Input current	mA	2.5 minimum at state 1 (6 mA at 24 VDC), 1.2 maximum at state 0				
	Input resistance	kΩ	4				
	Response time	ms	2.2 from 0 to state 1 3.3 from 1 to state 0				
Analog outputs	Resolution		12 bits for single-phase measuring range 0...20 mA, 12 bits for 2-phase measuring range ± 10 V				
	Conversion time	ms	1 for all channels				
	Conversion error						
	25 °C		Max. ± 0.35 % of upper measuring range value				
	60 °C		Max. ± 0.70 % of upper measuring range value				
Discrete outputs	Output load		≥ 3 kΩ on voltage output, ≤ 6 Ω on current output				
	Voltage	VDC	24 typical, 30 maximum				
	Type		Solid state switch				
	Signal Type		True high				
	Current capacity	A	1 per channel, 2 / group, 2 / module				
	Leakage current	mA	< 1 @ 24 VDC				
	On State Voltage drop	VDC	< 0.5 @ 1 A				
	Response time	ms	< 0.1				
	On to Off	ms	< 0.1				
	Output protection		The outputs are protected against overload and short-circuit-circuiting				
	Output indicator		1 red LED per "On" output in the event of an overload or short-circuit-circuiting				
	Error message		Message "I/O error" on bus adapter if module is defective				
	Max. Switching cycles		1000/hr (inductive load 1 A), 100/s (resistive load 1 A), 8/s (filament load 2.4 W)				
Potential isolation	Discrete input and output		None				
	Analog input to output		None				
	Analog input and output and to operating voltage	VAC	500 for 1 min				
	Operating voltage and all inputs and outputs from ground	VAC	500 for 1 min				
Power dissipation	Typical	W	4.0				
	Maximum	W	6.0				
Agency approvals			UL, CE, CSA, FM Class 1, Div. 2				

### Characteristics of discrete and analog I/O bases (continued)

Type of base unit		170 ANR 120 90	170 ANR 120 91
Number of inputs and outputs		1 x 6 analog inputs 2 x 4 discrete inputs 1 x 4 analog outputs 1 x 8 discrete outputs	
Operating voltage		VDC	24, range 19.2...30
Internal current		mA	400 @ 24 VDC
Analog inputs	Resolution		14 bit
	Input range	VDC	0...10 - 10...+ 10
	Input type		Single-ended
	Conversion time		0.75 ms maximum for 6 input channels
	Conversion error to full scale	%	0.2 @ 25 °C
	Max input signal	VDC	15 for voltage input
	Input resistance	MΩ	>1 for voltage inputs
Discrete inputs	Voltage	VDC	24
	Configuration		2 groups of 4 inputs
	Signal Type		True high
	Minimum on voltage	VDC	> 11
	Maximum off voltage	VDC	< 5
	Input current	mA	6
	Minimum On		
	Maximum Off	mA	2
	Input voltage range	VDC	+ 3...+ 32
	Input voltage surge		45 Volt peak for 10 ms
	Response time	ms	1.2,
	Off to On	ms	1.2
	On to Off		
Analog outputs	Resolution		14 bit
	Output range	VDC	0...10 - 10...+ 10
	Conversion time	ms	1.20 for all four channels
	Conversion error		max. + 0.4 % of upper measuring range value @ 25 °C
	Output load		> 2 kΩ minimum @ 0...10 VDC
	Fail state		Hold, minimum value, user defined
Discrete out	Voltage	VDC	10-30 operating, 50 for 1 ms maximum
	Type		Solid State Switch
	Signal type		True high
	Current capacity	A	0.25 per point, 2 per group, 2 per module
	Leakage current	mA	0.4 @ 30 VDC
	Surge current	A	2.5 for 1 ms
	On state voltage drop	VDC	< 0.4 @ 0.25 A current
	Response time	ms	1.2
	Off to On		
	On to Off	ms	1.05
Potential isolation	Output protection		The Outputs are protected against overload and short-circuiting
	Output indicator		1 LED per point
	Discrete input to output		None
	Analog input to output		None
Power dissipation	Typical	W	4.0
	Maximum	W	6.0
Agency approvals			UL, CE, CSA



170 AAI 000 00



170 AAO 020 00



170 AAM 090 00

Analog input bases

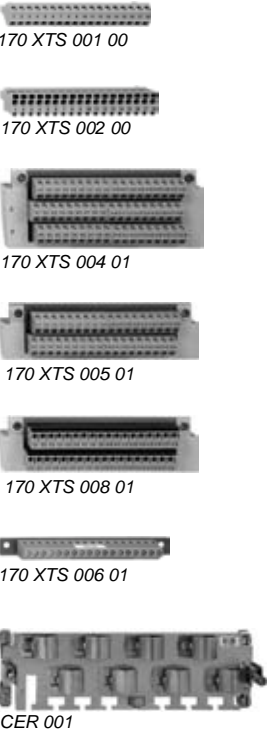
Type of inputs	Number of channels	Ranges	Reference	Weight kg
12 bits + sign	16 single-ended	$\pm 5\text{ V}$ , $\pm 10\text{ V}$ , 4-20 mA	170 AAI 140 00	0.215
15 bits + sign	4, differential	Pt 100, Pt 1000, NI 100 thermocouples B, E, J, K, N, R, S, T	170 AAI 520 40	0.215
	8, differential	$\pm 5\text{ V}$ , $\pm 10\text{ V}$ , 1-5 V $\pm 20\text{ mA}$ , 4-20 mA	170 AAI 030 00	0.215

Analog output bases

Type of inputs/ outputs	Number of channels	Ranges	Reference	Weight kg
12 bits + sign	4	$\pm 10\text{ V}$ , 0-20 mA	170 AAO 120 00	0.215
		$\pm 10\text{ V}$ , 4-20 mA	170 AAO 921 00	0.215

Discrete and analog I/O bases

Type		Ranges		Reference	Weight kg
Inputs	Outputs	Inputs	Outputs		
4 differential analog 13 bits + sign	2 analog 12 bits	$\pm 5\text{ V}$ , $\pm 10\text{ V}$ 1-5 V $\pm 20\text{ mA}$ , 4-20 mA	0-20 mA $\pm 10\text{ V}$	170 AMM 090 00	0.240
4 discretes	2 discretes 1 A	24 VDC	24 VDC		
6 analog 14 bits	4 analogs 14 bits	0-10 V	0-10 V	170 ANR 120 90	0.240
2 x 4 discretes	1 x 8 discretes 0.25 A	24 VDC	24 VDC		
6 analog 14 bits	4 analogs 14 bits	$\pm 10\text{ V}$	$\pm 10\text{ V}$	170 ANR 120 91	0.240
2 x 4 discretes	1 x 8 discretes 0.25 A	24 VDC	24 VDC		



References

Accessories

Description	Composition	Type of connection	Reference	Weight kg
Terminal blocks	Set of 3 connectors 1 row	Screw	170 XTS 001 00	–
		Spring	170 XTS 002 00	–
Bus Bar	3 rows	Screw	170 XTS 004 01	–
		Spring	170 XTS 003 01	–
	2 rows	Screw	170 XTS 005 01	–
		Spring	170 XTS 008 01	–
	1 rows	Screw	170 XTS 006 01	–
		Spring	170 XTS 007 01	–

Cable Grounding Rail	Used to connect the cable shielding	CER 001	–
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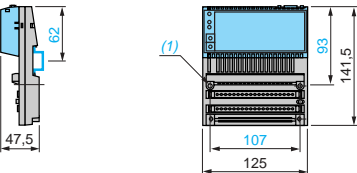
High vibration environment clips	Used to prewire the I/O base units. Requires screw or spring connection terminals	170 BDM 090 00	–
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Replacement parts

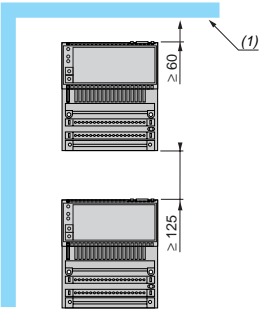
Description	Use	Reference	Weight kg
Sheets of labels	10 front labels for Momentum modules	170 XTS 100 00	–
Set of coding and locating devices	For screw or spring connection terminals	170 XCP 200 00	–

Dimensions, mounting

170 A●● rail or panel mounting



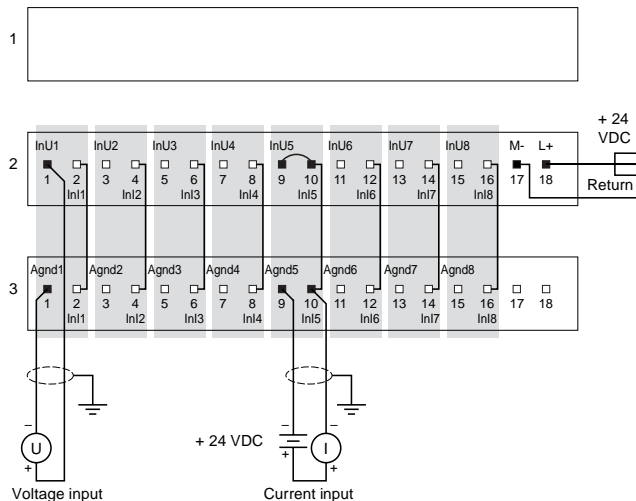
(1) 2 holes for M4 screws, for panel mounting.



(1) Equipment or enclosure.

### 170 AAI 030 00

Example of external wiring of 2-wire sensor

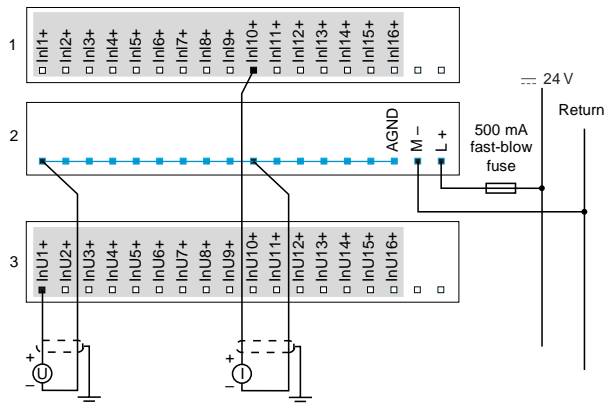


Voltage input

Current input

### 170 AAI 140 00

Example of external wiring of 2-wire sensor

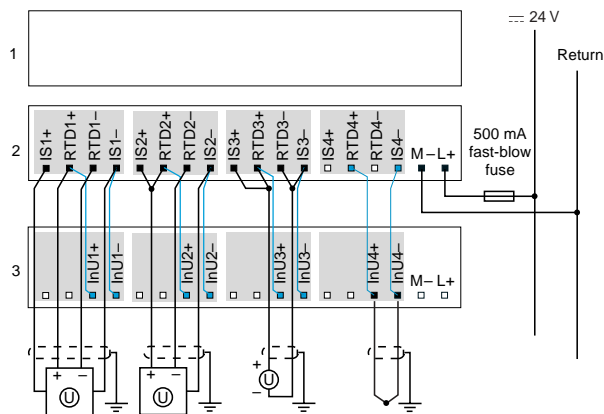


Group of channels

Internal wiring

### 170 AAI 520 40

Example of external wiring of sensor

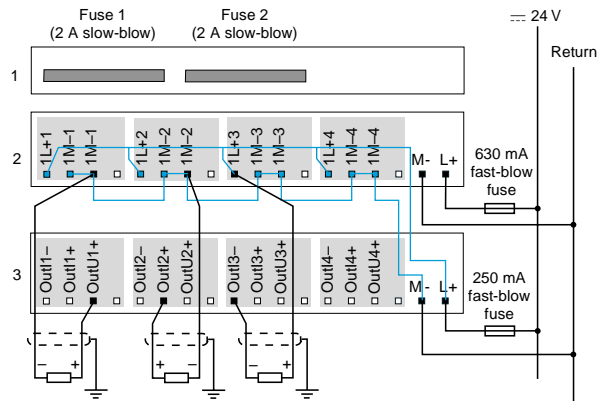


Group of channels

Internal wiring

### 170 AAO 120/921 00

Example of external wiring of 2-wire actuator

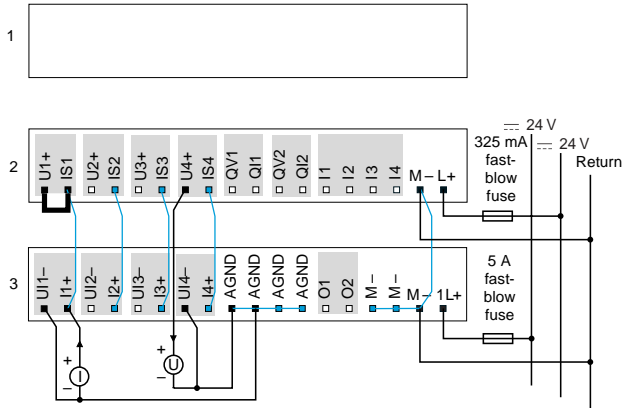


Group of channels

Internal wiring

### 170 AMM 090 00

#### Example of external wiring of 2-wire sensor

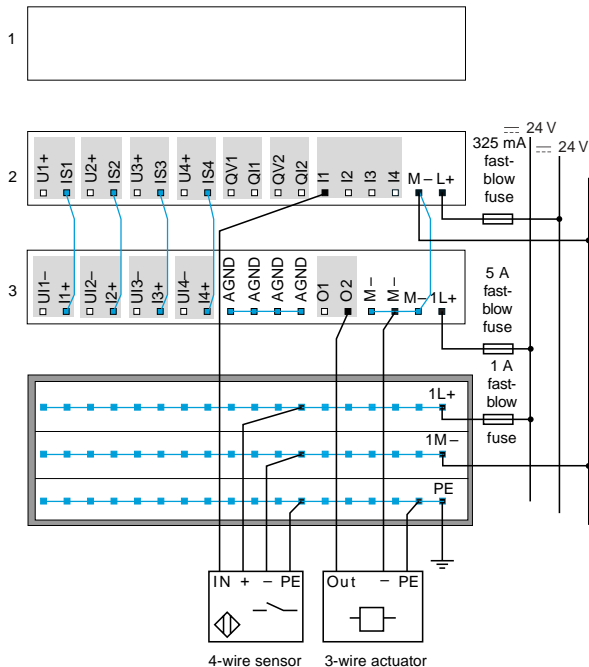


External bridge

Group of channels

Internal wiring

#### Example of external wiring of digital sensor/actuator



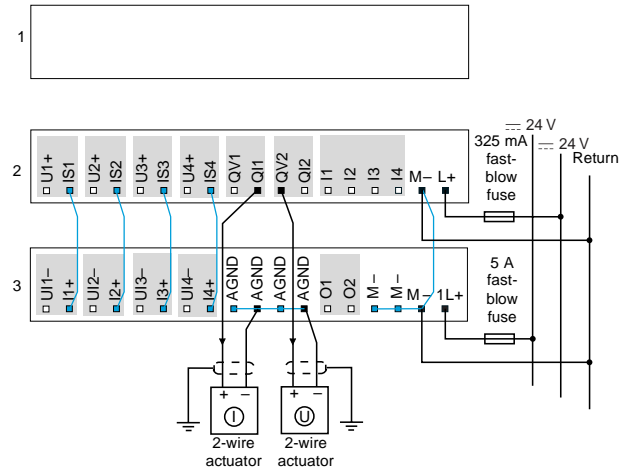
4-wire sensor

3-wire actuator

Group of channels

Internal wiring

#### Example of external wiring of 2-wire actuator

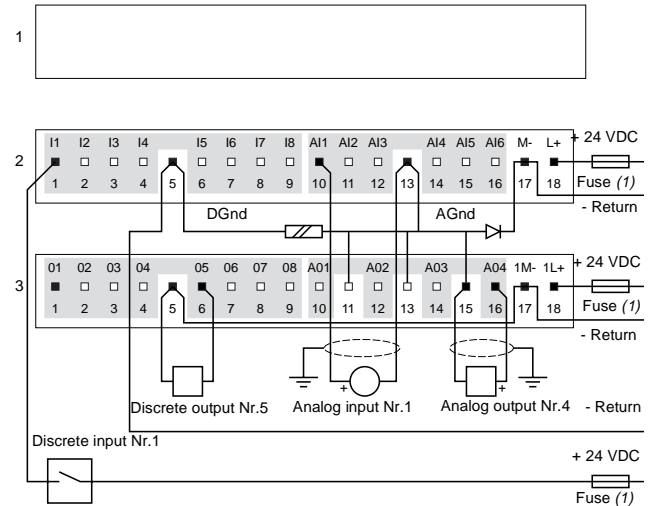


Group of channels

Internal wiring


### 170 ANR 120 90/91

#### Example of mixed discrete and analog I/O sensor/actuator field wiring



(1) Depending on application, max 5 A.



Product type		High-speed counter
		
Operating voltage		24 VDC
Unique features		2 independent, high-speed (10 kHz-200 kHz) counters
Modularity	Input channels	6 (3 per counter) True High Inputs
	Output channels	4 (2 per counter) True High Outputs
Input characteristics	Counter inputs	5 VDC differential input, 200 kHz counter; 24 VDC single-end input, 10 kHz counter
	Discrete inputs	6 (2 x 3) 24 VDC inputs: - voltage range, - 3 to + 30 VDC - response time, 3 ms Off to On or On to Off
Output characteristics	Counter outputs	Two 5 VDC differential outputs min 20 mA @ 24 VDC
	Discrete outputs	4 (2 per counter) 24 VDC outputs: - on current, 0.5 A per point, 1 A per counter - response time, < 0.1 ms Off to On; < 0.1 ms On to Off
Protection		
Surge	Input voltage	45 V peak for 10 ms
	Output current	5 A for 1 ms
Type of module		170 AEC 920 00
Pages		4/58

## I/O with Modbus Master Base



120 VAC

RS 485 2- or 4-wire Modbus port

## 6 True High Inputs

### 3 True High Outputs

—

1 group of 6 inputs (120 VAC @ 47 to 63 Hz):

- voltage range, 0 to 132 VAC
- response time, < 12.3 ms @ 60 Hz On to Off,  
< 12.5 ms @ 60 Hz Off to On

—

3 solid state switching outputs:

- on current, 0.5 A continuous per point, 1.5 A continuous per module
- response time, < 12.3 ms @ 60 Hz On to Off  
< 12.5 ms @ 60 Hz Off to On

## SERIPLEX Bus Interface



24 VDC

SERIPLEX bus connection

### Interface to bus input

### Interface to bus output

-

SERIPLEX version 2 bus input devices supported @ 24 VDC bus voltage

—

SERIPLEX version 2 bus output devices supported @ 24 VDC bus voltage

### Short circuit and overload for discrete outputs

500 V @ 2  $\Omega$  , power to common

—

170 ADM 540 80

170 ANM 050 10

### Presentation

The Momentum specialty module I/O bases provide support for unique applications that broaden the range of the Momentum offering. The specialty modules are:

- A 2-channel, High-Speed Counter Module Base - 170 AEC 920 00.
- A 120 VAC, 6-point Input/3-point Output Module Base with a Modbus Communication Port - 170 ADM 540 80.
- A Base Module that provides an interface between Momentum and the SERIPLEX Component Network - 170 ANM 050 10.

### High-Speed Counter

The 170 AEC 920 00 High-Speed Counter Module Base features 2 independent counters, along with 6 discrete inputs and 4 discrete outputs. This base can connect directly to either 5 VDC differential or 24 VDC single-ended encoders. The base supports two operating modes: incremental (up counter, down counter, and quadrature); and absolute (SSI up/down counter). The high-speed counter module can be connected directly to many standard communication networks, for communicating with programmable controllers, industrial computers, and other controllers, by installing one of the snap-on Momentum Comm Adapters onto the base.

### Input-Output Module with Modbus Comm Port

The 170 ADM 540 80 input/output module base has 6 discrete inputs and 3 discrete outputs for direct connection to 2- and 3-wire sensors and actuators, plus a Modbus Communication Port for connection to serial devices. This module can also be used as the I/O base for a programmable controller, in either a standalone or distributed I/O configuration, by installing one of the snap-on Momentum M1 Processor Adapters.

### SERIPLEX Module

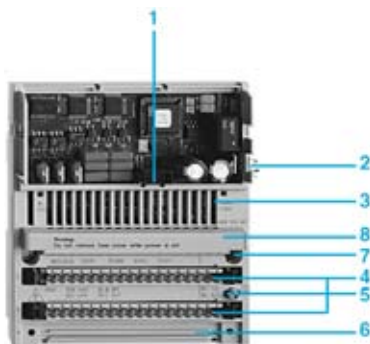
The 170 ANM 050 10 SERIPLEX interface for Momentum controllers allows the exchange of I/O data over the SERIPLEX Component Network. SERIPLEX, from Square D, is a device-level control network with over 3 million installed I/O points worldwide. The interface acts as a slave to its host controller, and as a master for the SERIPLEX bus. The SERIPLEX base unit may have a Momentum processor adapter or communications adapter mounted on it, thus supporting three powerful control architectures :

- Standalone Momentum controllers with SERIPLEX I/O devices.
- Networked, distributed Momentum controllers, some or all of which may connect to SERIPLEX I/O devices.
- A centralized control processor connecting to SERIPLEX bus devices and/or other types of I/O devices through a higher-level control network, such as Ethernet, Modbus Plus, DeviceNet, INTERBUS, or Profibus.

### Description

A specialty module I/O bases consists of the following components :

- 1 Internal interface connector for the communication module.
- 2 Locking and earth contact for the adapter.
- 3 LED status display.
- 4 Two connectors for the removable terminal blocks.
- 5 Earthing screw.
- 6 Grounding busbar mounting slot.
- 7 Mounting holes for a panel mount.
- 8 Protective cover for fuses (170 ADM 540 80) or connector for the removable terminal block.



Characteristics				
Model No.			170 AEC 920 00	170 ADM 540 80
Number of I/O	Counter		2 independant	–
	Inputs		2 x 3 discrete	1 x 6 discrete
	Outputs		2 x 2 discrete	1 x 3 discrete
Discrete inputs	Operating voltage	V	24 DC	120 AC @ 47... 63 Hz
	Input range	V	- 3...+ 30 DC	0...132 AC
	Input surge	V	45 peak for 10 ms	200 AC for 1 cycle
	Input current	On	2.5 minimum	5.5 minimum
		Off	1.2 maximum	1.9 maximum
	Switching level	V	11 DC minimum on voltage 5 DC maximum off voltage	79 AC minimum on voltage 20 AC maximum off voltage
	Response time	Off to on	3	< 12.5 @ 60 Hz
		On to off	3	< 12.3 @ 60 Hz
Discrete outputs	Signal type		True High	
	Operating voltage	V	24 DC	120 AC @ 47 to 63 Hz
	Signal type		True High	
	On state voltage drop	V	< 0.5 DC @ 0.5 A current	< 1.5 AC @ 0.5 A current
	Fault sensing		Overload and short circuit	1 fuse, 2.5 A @ 250 VAC
	Current capacity		0.5 per point	0.5 continuous per point
			1 per counter	–
			2 per module	1.5 continuous per module
	Current	Leakage	< 1 @ 24 VDC	1.9 @ 120 VAC
		Surge	5 A for 1 ms	30 minimum
Counter inputs	Response time	Off to on	< 0.1	< 12.5 @ 60 Hz
		On to off	< 0.1	< 12.3 @ 60 Hz
	Incremental counters		Up counter, down counter, quadrature	–
	Absolute SSI counter		Up/down counter with 4 sub-modes	–
	Input signals	VDC	5 differential input 24 single-ended input	–
	Counter speed (max)	kHz	200, differential inputs 10, single-ended inputs	–
	Counter capacity		24 bits plus sign per counter	–
Modbus port	Counter configuration		Via comm adapter (8 input words, 8 output words)	–
	Type		–	RS-485, 2- or 4-wire
	Communication rates	bit/s	–	19200 and 9600
	Format		–	8-bit RTU / 7-bit ASCII
	Modbus address range		–	0...247
Current consumption	Timeout	ms	–	150 after transmission
		mA	280	125 @ 120 VAC
Agency approvals			UL, C E, CSA	

## Characteristics (continued)

Model No.	170 ANM 050 10	
Communication type		SERIPLEX bus connection
Operating voltage	VDC	24
Modularity		Interfaces to bus input and bus output
Input characteristic		SERIPLEX version 2 bus input devices supported at 24 VDC bus voltage
Output characteristic		SERIPLEX version 2 bus output devices supported at 24 VDC bus voltage
Input voltage surge	V	500 @ 2 Ω, power to common
Current consumption	mA	Max. 450 @ 24 VDC
Protection		Short circuit and overload for discrete outputs
Agency approvals		UL, C€, CSA

## References

4



170 AEC 920 00



170 ADM 540 80

### Modules

Description	Characteristics	Reference	Weight kg
High-speed counter Module Base	2 independent counters	170 AEC 920 00	0.070
I/O module base with Modbus comm port	RS 485 Modbus port 6 inputs, 3 outputs	170 ADM 540 80	0.070
SERIPLEX bus interface	Interfaces to bus input and bus output	170 ANM 050 10	0.070

### Accessories (1) Replacement parts

Description	Use	Reference	Weight kg
Sheets of labels	10 front labels for Momentum modules	170 XTS 100 00	—

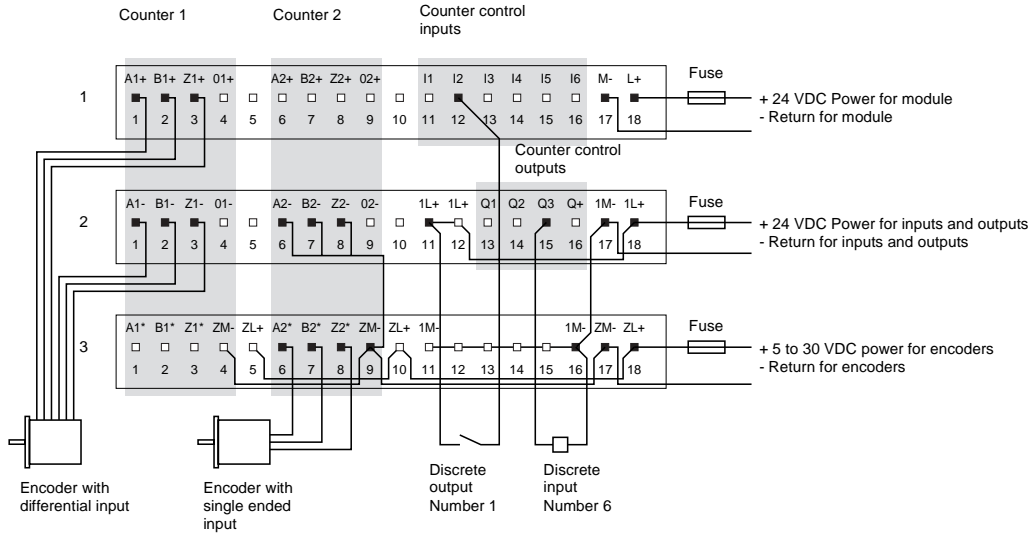
### Documentation

Description	Use	Reference	Weight kg
Momentum I/O bases	User guide for: 170 AEC 920 00	870 USE 008 00	—
	170 ADM 540 80	870 USE 002 00	—
SERIPLEX	Module Instruction Bulletin	30298 086 01	—
	Module Installation "Mini-book"	30298 085 01	—
	Installation and Troubleshooting Guide	30298 035 01A	—

(1) Terminal blocks, bus bar, cable grounding rail and discrete input simulator, see page 4/36.

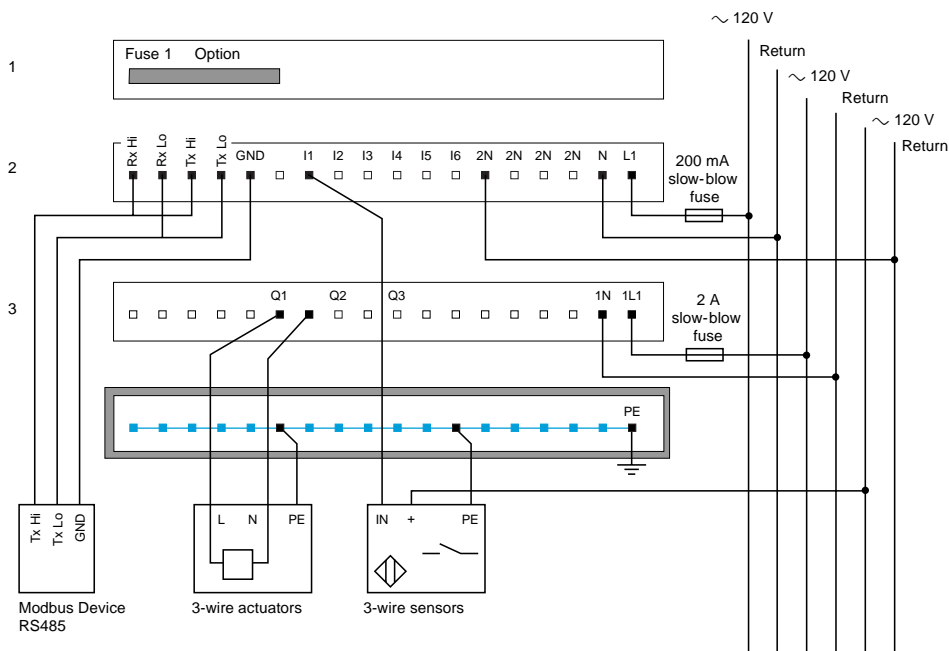
### 170 AEC 920 00

#### A 2-encoder and input/output field wiring example



### 170 ADM 540 80

#### A Modbus device and input/output field wiring example



Applications

Communication Adapters for Ethernet

Communication Adapter for INTERBUS



Bus and network type

Ethernet

INTERBUS

SUPI 3

Topology

Physical interface

IEEE 802.3 standard

DIN 19 258 standard

Method of access

CSMA-CD

Master/Slave

Bit rate

10 Mbit/s

10/100 Mbit/s

500 Kbit/s

Medium

Type

Twisted pair CAT5

Twisted pair

Fiber optic

Topology

Star

Ring

Redundancy

No

No

Maximum number of devices

–

40 per installation remote bus module (up to 254 bus terminal modules)

Maximum length

1000 m per segment

12800 m

Type of communicating module

170 ENT 110 02

170 ENT 110 01

170 INT 110 03

170 INT 120 00

Pages

4/65

Consult our catalog "Momentum automation platform"

Momentum I/O modules on Profibus DP bus



Momentum I/O modules on DeviceNet network



Profibus DP

DeviceNet

EN 50170 standard

—

Master/Slave

CSMA-CD

12 Mbit/s...9.6 Kbit/s depending on length

500 Kbit/s

Twisted pair

Multidrop

Multidrop, ring

Multidrop

No

No

32 without repeater  
126 with repeaters

64

1200 m

500 m with repeaters

170 DNT 110 00

170 LNT 710 00



Applications

Communication Adapters for Modbus Plus



Bus and network type

Modbus Plus

Topology	Physical interface
	Method of access
	Bit rate

Modbus Plus
Token bus
1 Mbit/s

Medium	Type
	Topology
	Redundancy

Twisted pair		
Multidrop		
No	Yes	No

Maximum number of devices	Per segment
	Overwall

32
64 (without repeaters)

Maximum length

5 000 m with repeaters

Type of communicating module

170 PNT 110 20	170 PNT 160 20	170 NEF 110 21
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Pages

4/69

Momentum distributed I/O modules on Fipio bus for TSX Series 7 and April 5000 PLCs

Momentum distributed I/O modules on Fipio bus for Premium PLCs



		Fipio	
		Fip standard	
		Bus managed by bus arbitrator	
		1 Mbit/s	
		Twisted pair	
		Multidrop	
Yes	No		
			128
		5 000 m with repeater	15 000 m with repeaters
170 NEF 160 21		170 FNT 110 00	170 FNT 110 01
		Consult our catalog "Momentum automation platform"	

### Presentation

The Model 170 ENT 110 02 and 170 ENT 110 01 Ethernet Communication Adapters for the Momentum I/O product line provide a direct connection to Ethernet-based networks for the entire family of Momentum I/O modules. This connectivity enables communications with a full range of Ethernet TCP/IP compatible control products that includes programmable controllers, industrial computers, motion controllers, operator control stations, host computers, and other controls. This communication network provides a flexible, cost-effective solution for communicating factory floor information to various layers of an integrated manufacturing facility.

The 100BASE-TX Ethernet Communication Adapter, the 170 ENT 110 01 (and the 10BASE-T adapter, the 170 ENT 110 02) are single adapters designed to plug on to any of the Momentum Input/Output module bases, and conforms to the requirements of the Ethernet Communication Network.

The Ethernet IP addressing scheme allows an unlimited number of Momentum I/O modules or connections on the network. Using standard Ethernet hubs, routers, and bridges, the performance and distance capability of the Ethernet network can be tailored to meet the requirements of almost any control application.

The Ethernet Communication Adapter uses the standard Modbus message structure and control commands over the TCP/IP protocol, which simplifies implementation by control engineers while providing information that can be communicated over standard network media to all enterprise applications.

Since Modbus on TCP/IP over Ethernet is supported by Schneider's Quantum and Premium controller families, Momentum I/O can be added to existing control systems where additional I/O capacity of a distributed I/O sub-network is needed.

The Ethernet Communication Adapter requires connection to a BOOTP server for setting the module's IP parameters, including its own unique IP address, default gateway, and sub-net mask, all of which is stored in the communication adapter's flash memory. Schneider Electric's automation business offers BOOTP Lite Ethernet software as a free download from the automation Internet web site, [www.schneiderautomation.com](http://www.schneiderautomation.com).

### Description

The 170 ENT 110 0● Ethernet Communication Adapters comprises on the front panel:

- 1 Ethernet connector for 100BASE-TX interface (170 ENT 110 01) or 10BASE-T interface (170 ENT 110 02) interface (RJ45).
- 2 Area for Label (label shipped with I/O base).
- 3 LED Status Indicators comprising for the 170 ENT 110 02:
  - Run (green), module health,
  - LAN Active (green), Ethernet network status.

LED Status Indicators comprising for the 170 ENT 110 01:

- Run (green), module health,
- 10T (green), 10 Mbit/s network activity,
- 100T (amber), 100 Mbit/s network activity,
- ST (green), Ethernet network status.



### Characteristics

Model No	170 ENT 110 02	170 ENT 110 01
Communication network	Ethernet TCP/IP	
Communication rate	Mbit/s 10	10/100
Number of nodes (devices)	Unlimited with hubs and routers; 32 units point-to-point	
Media	Twisted pair cable, 10BASE-T	Twisted pair cable, 100BASE-TX
Flash memory	128 K for IP parameter storage	
Distance	m (ft) 100 (328) twisted pair cable without repeaters; unlimited distance with repeaters	
Connectors	RJ45 10BASE-T	RJ45 100BASE-TX
Error checking	CRC-32 error check	
Error and fail states	Fail safe	
Addressing	Unique IEEE global address, IP address user assigned	
Adapter configuration	BOOTP server to assign IP parameters	
Mode of operation	Master slave, peer-to-peer	
Topology	Multi-drop bus, star	
Packaging	Standard momentum communications adapter enclosure - IP 20 environment	
Indicator lights	Run and activity lights	Run, 10 Mbit/s, 100 Mbit/s, and status lights
Power source	Power supply on-board the I/O base	
Hot swapping of modules	Yes	
Agency approvals	UL, CUL, CSA, FM Class I, Div. II	UL, CUL, CSA

### References

#### Module

Description	Communication rate	Reference	Weight kg
Ethernet TCP/IP Communication Adapter	10 Mbit/s	170 ENT 110 02	0.070
	10/100 Mbit/s	170 ENT 110 01	0.070

#### Accessories

BOOTP Lite Ethernet Software	Download from <a href="http://www.schneiderautomation.com">www.schneiderautomation.com</a>
Ethernet TCP/IP Communication Adapter User Guide	870 USE 112 00

521501



170 ENT 110 02

### Presentation

Modbus Plus Communication Adapters for the Momentum I/O product line can be plugged into any Momentum I/O base to create a functional I/O unit on the Modbus Plus bus, and to provide a direct connection to the Modbus Plus Network for the full family of Momentum I/O modules. This connectivity enables communications with all of the Modbus Plus compatible control products - including programmable controllers, industrial computers, operator control stations, drive systems, and other controls - to provide a flexible, cost-effective solution for distributing I/O modules throughout a large area. To expand the capabilities of the Modbus Plus Network for distributed I/O applications, the communication adapters have been designed to permit up to 64 Momentum I/O modules to be connected to the network without the need for signal repeaters.

Each Momentum I/O module is an individual node on the Modbus Plus network with its address user-selected on the dual rotary switch on the front of the communication adapter. The Momentum I/O modules can be configured for the network, and assigned program reference numbers, by using either the Peer Cop function or the MSTR function block instruction in the programmable controller or the Modbus Plus configuration in an industrial computer.

There are four types of Communication Adapters available :

- 170 PNT 110 20, Single Port, IEC Data Format.
- 170 PNT 160 20, Redundant Port, IEC Data Format.
- 170 NEF 110 21, Single Port, 984 Data Format.
- 170 NEF 160 21, Redundant Port, 984 Data Format.

### IEC Data Format

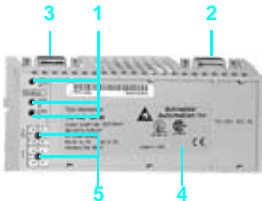
This version of the Momentum Modbus Plus Communication Adapter communicates I/O data to the programmable controller in the IEC data format, which has bit numbering 0 through 15, right to left, within the data word (i.e., input or output number 1 is bit number 0).

### 984 Data Format

This version of the Momentum Modbus Plus Communication Adapter communicates I/O data to the programmable controller in the traditional 984 data format, which has bit numbering 1 through 16, left to right, within the register (i.e., input or output number 1 is bit number 1).

Since Modbus Plus is supported by the Quantum and 984 controller families, Momentum I/O can be added to existing control systems where additional I/O capacity or a distributed I/O sub-network is needed, because of requirements for the control system. The figures below illustrate typical control systems using Momentum I/O modules on the Modbus Plus network with programmable controllers and industrial computer systems.

Description



Each 170 PNT/NEF communication module comprises:

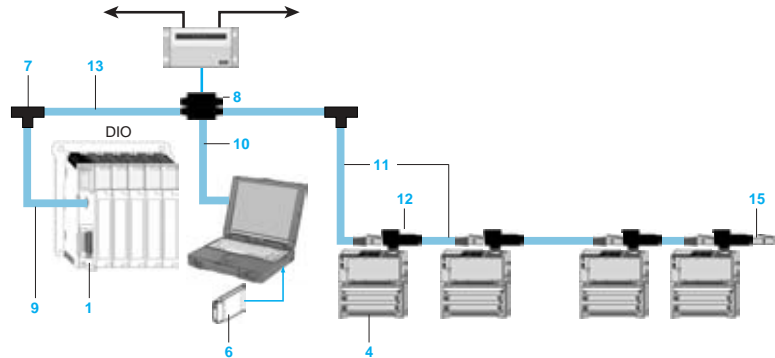
- 1 Three indicator lights (LEDs):
  - MB + ACT indicator light (green) : module powered up or communicating.
  - ERR A indicator light (red) : communication error network A.
  - ERR B indicator light (red) : communication error network B. (for redundant model).
- 2 A 9-way male SUB-D connector for connecting to the Modbus Plus network.
- 3 A 9-way male SUB-D connector for a redundant Modbus Plus network.
- 4 A slot for an identification label (supplied with all I/O sub-bases).
- 5 Two switches for coding the slave address on the bus.

Characteristics

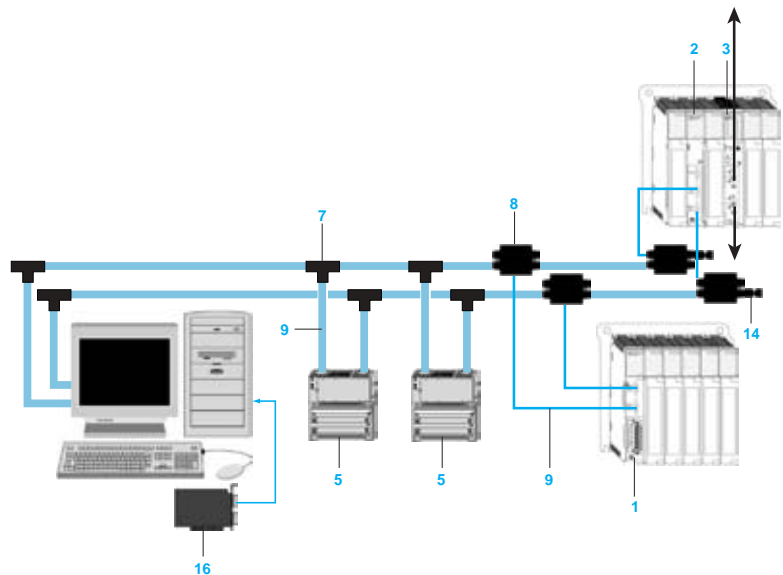
Type of module		170 PNT 110 20	170 PNT 160 20	170 NEF 110 21	170 NEF 160 21
Communication network		Modbus Plus			
Master PLC on the network		Quantum, Premium	Quantum	Compact 984	
Structure	Type	Industrial			
	Redundancy	No	Yes	No	Yes
	Topology	Multi-drop, devices connected using extension cable or tap-off cable			
	Length	5,000 m (16000 ft) maximum with repeaters			
	Access method	Token bus			
Transmission	Bit rate	1 Mbit/s			
	Medium	Twisted pairs			
Data Format		IEC Data format		984 Data Format	
Number of Momentum devices	Per segment	31 connection points			
	Maximum	63 for all segments			
Power source		Power supply on-board the I/O base			
Behaviour in the event of a communication error		Discrete I/O: forcing to state 0 Analogue I/O: configurable (maintain value, fallback to 0 or full scale value)			
Services		Configuration: Peer cop and MSTR function block, “peer-to-peer” mode			
Agency approvals		UL, CUL, CSA, FM Class I, Div. II			

### Network topology

#### Momentum I/O modules in a distributed control system



#### Momentum I/O modules with Modbus Plus double cable in a distributed and redundant control system



- 1 140 CRA 211 10: Quantum Modbus Plus Drop Interface and power supply, single-cable support, 115/230 VAC.
- 2 140 NOM 212 00: Quantum Modbus Plus Head-end Interface, redundant support, twisted pair cable.
- 3 140 NOM 252 00: Quantum Modbus Plus Head-end Interface, single-cable support, fiber optic cable.
- 4 170 PNT 110 20 or 170 NEF 110 21: Momentum Modbus Plus Communication Adapter, non-redundant network.
- 5 170 PNT 160 20 or 170 NEF 160 21: Momentum Modbus Plus Communication Adapter, redundant network.
- 6 416 NHM 212 33: Modbus Plus Type III PCMCIA Card, single port ; Or 416 NHM 212 34: Modbus Plus Type III PCMCIA Card, single port, "plug and play".
- 7 990 NAD 230 00: Modbus Plus Tap, IP 20.
- 8 990 NAD 230 10: Modbus Plus Tap, IP 65.
- 9 990 NAD 211 10/30: Modbus Plus Drop Cable (lengths: 2 or 4 or 6 m).
- 10 990 NAD 215 10: Modbus Plus Ruggedized Tap Programing Cable, 3.05 m.
- 11 170 MCI 020/021●●: Modbus Plus RJ45 cable (lengths: 0.25 , 1 , 3 or 10 m).
- 12 170 XTS 020 00: Modbus Plus "T" Connector (DB9 base).
- 13 490 NAA 271 0●: Standard Modbus cable (lengths: 30, 150, 300, 450 or 1500 m).
- 14 990 NAD 230 11: Modbus Plus Ruggedized Tap Terminators.
- 15 170 XTS 021 00: Modbus Plus RJ45 Terminator.
- 16 416 NHM 300 32: Modbus Plus PCI PC Adapter Card, dual ports.



170 PNT 110 20/NEF 110 21



170 PNT 160 20/NEF 160 21



AS MBKT 085

### References

Description	Connection	Item (1)	Bus master PLC	Reference	Weight kg
Communication modules for Momentum I/O sub-bases	Non-redundant Modbus Plus network	4	Premium, Quantum	170 PNT 110 20	–
			Compact 984	170 NEF 110 21	–
	Redundant Modbus Plus network	5	Quantum	170 PNT 160 20	–
			Compact 984	170 NEF 160 21	–

Description	Use	Mounting on	Item (1)	Reference	Weight kg
Modbus Plus taps	IP 20 junction box for tap-off connection (T)	–	7	990 NAD 230 00	0.230
	IP 20 junction box for tap-off connection (T), connection of cable on screw terminal block with one RJ45 connector in front	DIN profile	–	990 NAD 230 20	–
		Panel	–	990 NAD 230 21	–
	Modbus Plus Tap (IP 20), standard Modbus cable with one RJ45 connector in front	Panel	8	990 NAD 230 10	0.650
	IP 20 tee with 2 RJ45 connectors for Modbus cable and one 9-way Sub-D connector for tap link devices	–	12	170 XTS 020 00	0.260
Terminator connector kit (set of 2)	2 impedance adaptors for box (IP 20) 990 NAD 230 20/21	–	1	990 NAD 230 22	–
	2 impedance adaptors for box (IP 20) 990 NAD 230 10	–	14	990 NAD 230 11	–
	2 impedance adaptors for tee (IP 20) 170 XTS 020 00	–	15	170 XTS 021 00	–

### Connection cables

Description	Use		Item (1)	Length	Reference	Weight kg
	From	To				
Standard Modbus Plus cables	T-junction box 990 NAD 230 00, 990 NAD 230 11	T-junction box 990 NAD 230 00, 990 NAD 230 11	13	30 m	490 NAA 271 01	–
				150 m	490 NAA 271 02	–
				300 m	490 NAA 271 03	–
				450 m	490 NAA 271 04	–
				1500 m	490 NAA 271 06	–
Modbus Plus cable for RJ45	Tee 170 XTS 020 00	Tee 170 XTS 020 00	11	0.25 m	170 MCI 021 10	–
				1 m	170 MCI 021 36	–
				3 m	170 MCI 021 20	–
				10 m	170 MCI 021 80	–
Modbus Plus Drop cables	Communication modules for Momentum I/O sub-bases 170 PNT/NEF	T-junction box 990 NAD 230 00/10	9	2.4 m	990 NAD 211 10	–
				6 m	990 NAD 211 30	–

Description	Use		Length	Reference	Weight kg
	From junction box	To equipment, cable outlet of 9-way SUB-D type connectors			
Modbus Plus Drop Cable	Flying leads	Left side	2.4 m	990 NAD 218 10	–
			6 m	990 NAD 218 30	–
		Right side	2.4 m	990 NAD 219 10	–
			6 m	990 NAD 219 30	–

### Connecting accessories


Description	Use for	Reference	Weight kg
RJ45 Crimp tool	Crimping the RJ connectors	490 NAB 000 10	–
9-way female SUB-D connector	Communication module connection	AS MBKT 085	–
Wiring tool	Fitting trunk cables and drop cables in local site tap	043 509 383	–

### Other connection accessories

Contact your Regional Sales office

(1) Item, see page 4/68.



Type	M1 processor adapters			
				
RAM memory	64 Kbit		256 Kbit	
Flash memory	256 Kbit			
984 LL program memory	2.4 Kbit		12 Kbit	
IEC program memory	—		160 Kbit	
Data memory	2 Kbit		4 Kbit	
Scan time	1 ms/K	0.63 ms/K	1 ms/K	0.63 ms/K
Clock speed	20 MHz	32 MHz	20 MHz	32 MHz
I/O points	2048		4096	
I/O drops	Up to 2048 I/O points with Modbus Plus option adapter		80 with ProWORX 128 with Concept	
Power source	Power supply on-board the I/O bases			
Communication ports	1 RS 232 Modbus		1 RS 232 Modbus 1 RS 485 Modbus	1 RS 232 Modbus 1 I/O bus
IEC executive				Compatible
Type of module	171 CCS 700 00	171 CCS 700 10	171 CCS 780 00	171 CCS 760 00
Pages	Consult our catalog "Momentum automation platform"			

## M1E processor adapters



512 Kbit

544 Kbit

512 Kbit

512 Kbit for 171 CCC 980 20  
1 Mbit for 171 CCC 980 30512 Kbit for 171 CCC 960 20  
1 Mbit for 171 CCC 960 30

18 Kbit

240 Kbit

0 Kbit for 171 CCC 980 20  
200 Kbit for 171 CCC 980 300 Kbit for 171 CCC 960 20  
200 Kbit for 171 CCC 960 30

24 Kbit

1 ms/K

0.3 ms/K

32 MHz

50 MHz

8192

Up to 2048 I/O points with  
Modbus Plus option adapter80 with ProWORX  
128 with ConceptUp to 2048 I/O points with  
Modbus Plus option adapter80 with ProWORX  
128 with Concept1 RS 232 Modbus  
1 RS 485 Modbus1 RS 232 Modbus  
1 I/O bus1 Ethernet  
1 RS 485 Modbus1 Ethernet  
1 I/O bus

Supplied with 171 CCC 980 30

Supplied with 171 CCC 960 30

171 CCC 780 10

171 CCC 760 10

171 CCC 980 20/30

171 CCC 960 20/30

4

Configuration

Modbus Plus option adapters



Communication network

Modbus Plus

Communication port(s)

1 Modbus Plus

2 redundant Modbus Plus

Comm port connector

9-pin D-shell

Time-of-day clock

On-board,  $\pm 13$  sec/day accuracy

Back-up batteries

2 user-replaceable AAA alkaline

Voltage

5 VDC supplied by I/O base

Operating temperature

0 ... 60°C

Humidity

5 ... 95%, relative noncondensing

Shock

$\pm 15$  g peak, 11 ms, half-sine wave

Vibration

10 ... 57 Hz @ 0,075 mm d.a.

Type of module

172 PNN 210 22

172 PNN 260 22

Page

Consult our catalog "Momentum automation platform"

Serial option adapter



General-purpose serial communications

1 software-selectable RS 232/RS 485 serial port

4

172 JNN 210 32